



सत्यमेव जयते

INDIAN AGRICULTURAL
RESEARCH INSTITUTE, NEW DELHI

19682 & 23557

I.A.R.I.6.

GIP NLK—H-3 I.A.R.I. —10-5 55—15,000

Journal of the Kansas Entomological Society

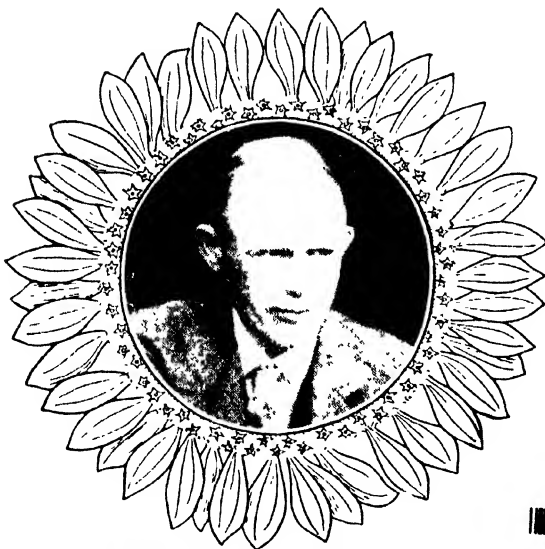
Volume 18 *24*

January, 1945

Number 1

PUBLICATION COMMITTEE

PAUL B. LAWSON, Editor, Lawrence
R H BEAMER, Lawrence R H PAINTER, Manhattan
DWIGHT ISELY, Fayetteville, Ark



JAMES WALKER McCULLOCH
1889-1929

19682



IARI

Entered as second-class matter June 7, 1939 at the Post Office at
Manhattan, Kansas, under the Act of August 24, 1912.

JOURNAL OF THE KANSAS ENTOMOLOGICAL SOCIETY

A quarterly journal published in January, April, July and October devoted to Entomology in the Western Mississippi Basin and the proceedings of the Kansas Entomological Society.

Manuscripts for publication may be sent to any of the publication committee.

The Kansas Entomological Society does not make exchanges since the Society does not maintain a library.

Subscription to the Journal must be paid in advance. The subscription rate is so low that second notices are not ordinarily sent out.

Payment of Canadian or other foreign subscriptions and bills must be made by international Postal Money Order or by a draft on a New York bank and payable in U.S.A. dollars.

Subscribers are urged to give us their full cooperation in these matters.

Subscriptions should be sent to Donald A. Wilbur, Entomology Department, Kansas State College, Manhattan, Kansas.

Subscriptions in the U.S.A.,	\$1.50 per year	Single Copy
Canadian or foreign subscriptions,	1.75 per year	60 cents

KANSAS ENTOMOLOGICAL SOCIETY

President, W. T. Emery, Manhattan, Kansas

Vice-president, Paul B. Lawson, Lawrence, Kansas

Secretary-Treasurer, Donald A. Wilbur, Manhattan, Kansas

Vol. 18, No. 1, January, 1945

1.4

This issue mailed January 20th

Kansas Entomological Society

Volume 18

January, 1945

Number 1

CONTRIBUTIONS TO THE KNOWLEDGE OF THE PSYLLIDAE OF MEXICO

LEONARD D. TUTHILL

Iowa State College, Ames, Iowa

(continued from last issue)

The remainder of the records are given in chronological order. Desierto de los Leones, 20 km. southwest of Mexico, D. F., swept from dense undergrowth in forest, September 23, 1923. Chapultepec Heights, southwest of Mexico, D. F., rolling hills with agave and *Opuntia*, swept in the floor of a dry barranca on *Viguiera* sp., February 5, 1924. Chapingo, Mexico, on alfalfa April 30, 1924. Chapingo, on *Senecio salignus* July 11, 1924. Summit of Mount Ajusco, south of Mexico, D. F., swept from grass, May 10, 1925. Chapultepec Heights, D. F., swept from low vegetation February 16, 1926. Cerro Huixtepec near San Cristobal Las Casas, Chiapas, 2700 meters, swept from grass between *Baccharis* bushes, June 14, 1926. Zontehuitz Mountain, north of San Cristobal Las Casas, swept from *Baccharis* and *Gaultheria* at the summit, 2800 meters, 280 specimens, June 20, 1926. San Cristobal Las Casas, swept from treeless hill, covered with flowers, in the village June 29, 1926; swept from flowers on top of a hill in the village, July 2, 1926; at light July 3, 1926. Santa Barbara on Mexico-Puebla road, swept from corn, May 14, 1927. Jalapa, Vera Cruz, on light, March 30, 1933. Bella Vista, 12 km. from Mexico, D. F. on highway to Cuernavaca, swept from shrubs, September 17, 1933. Lomas de Chapultepec, Mexico, D. F. swept from flowers of *Schinus molle*, May 27, 1928. Mexico, D. F., on *Salix*, September 5, 1938. Monte Alto mountain range, northwest border of the Valley of Mexico, swept on *Baccharis* shrubs, November 15, 1938. Lagunas de Zempoala, Morelos, swept on flowers of *Senecio salignus*, Lake Tonatihagua, May 5, 1941.

Originally described from specimens from California it has also been recorded from Arizona, New Mexico and Texas, United States.

The probable host is *Baccharis* sp.

The type is in the Crawford Collection, United States National Museum.

Trioza proximata Crawford

Figs. 36, 37.

1911 *Trioza proximata* Crawford, Pom. Coll. Jour. Ent. 3:424, 429, 435

1941 *Trioza proximata* Caldwell, Ohio Jour. Sci. 41:422

Length to tip of folded wings 3 to 3.5 mm.

Color: Light green to testaceous. Tips of antennae and styliform portion of female genital segment black.

Structure: Head narrower than thorax. Occiput large, posterior margin of eyes opposite lateral ocelli. Vertex with discal sulci, prominent medial suture. Genal processes short, heavy, blunt, 0.5 as long as vertex. Antennae twice as long as width of head. Thorax broad, strongly arched. Pronotum strongly descending but not depressed below plane of vertex. Forewings large, 2.5 times as long as wide, rounded apically; Rs long, somewhat sinuate, marginal cells equal. Hind wings 0.7 as long as forewings. Metatibiae with serrate basal tubercle, 1 outer and 3 inner apical spines. Anterior portion of metacoxae short, raised.

Male proctiger long, caudal margin arcuately produced, prominent epiphysis at apex. Forceps long; in lateral view moderately broad, curved cephalad, tapering, apices black, with small black tooth; in caudal view almost straight sided, slightly arched, row of setae on medial margin. Female genital segment very long, 0.75 as long as remainder of body, proximal 0.3 large, tapering distal portion very slender, acuminate and appressed to ovipositor, latter extending beyond valves; dorsal valve longer than ventral.

This species is apparently quite common in Mexico, numerous specimens being at hand. Outside of Mexico it has been collected to date only in southern Arizona. Closely related to *T. collaris* it can usually be distinguished from the latter by its smaller size and more rounded wings. The female genital segment is distinctive. The male is very similar to *collaris*.

Specimens at hand bear data as follows: Desierto de los Leones, southwest of Mexico, D.F., swept from undergrowth in forest (*Senecio*, *Salvia*, etc.) September 23, 1923; swept from grass (Zacaton) in open pine forest between the Ajusco and the Xitle volcano, north of Mexico, D. F., October 7, 1923; lava fields of Pedregal, south of Mexico, D.F., swept from *Senecio praecox*, December 2, 1923; Mexico, D.F., suburb Hippodromo, swept from lawn after five rainless months, May 4, 1924; Chapingo, Mexico, *Senecio salignus*, July 11, 1924; Desierto de los Leones, swept from *Baccharis* sp., February 22, 1925; Peñon de Baño on the shores of Texcoco Lake, a small volcano with scanty xerothermic vegetation, January 31, 1926; San Jacinto, D. F., at light, November 16, 1931, June 30, 1932; Mount Telapón, Mexico, summit, 3900-4000 meters, swept on grass, September 29, 1940; Xoconusco Valley, near Ixtapan del Oro, Mexico swept on low weeds in a former corn field, June 8, 1941; swept from a lawn scattered with trees and shrubs in Chapultepec Park, Mexico, D. F., through the summer of 1941 (an ecological survey) on May 30, June 15 and 29, July 13 and October 9.

Originally described from specimens from Oaxaca and Orizaba it has also been recorded from Mexico, D. F., and environs by Caldwell.

Host: Unknown

Type in Crawford Collection, United States National Museum

***Trioza nigriscutum* n. sp.**

Figs. 38, 39.

Length to tip of folded wings 3.75 mm.

Color: General color, including forewings, greenish yellow. Mesoscutum,

except small marginal areas, black or dark brown, abdomen green.

Structure: Head nearly as wide as thorax, almost vertical. Vertex plane, discal impressions broad and shallow. Genal processes large, straight, acute, not touching from base, as long as vertex, on nearly same plane as vertex. Antennae 1.66 times as long as width of head. Thorax well arched. Pronotum depressed below plane of vertex. Prescutum nearly as long as wide. Forewings large, straight, 3 times as long as wide, bluntly angulate; costa unusually straight, Rs very long, somewhat sinuate, marginal cells equal. Hind wings 0.7 as long as forewings. Metatibiae with small basal tubercle, 1 outer and 3 inner apical spines. Metacoxae not produced anteriorly.

Male proctiger short, slightly produced caudad below apical epiphysis. Forceps shorter than proctiger; in lateral view stout, straight, slightly curved on caudal margin to blunt apices; in caudal view stout, slightly bowed to blunt apices, heavily setate on mesal margins.

Holotype, male, swept in dense bush in pine and oak tree forest on the summit of Cerro Vista Hermosa (2400 meters) in the Moshbiquil Range near San Cristobal Las Casas, Chiapas, July 17, 1926, in Dampf's collection.

Host: Unknown

***Trioza longigenae* n. sp.**

Fig. 40.

Length to tip of folded wings 3 mm.

Color: General color black. Antennae, tibiae and tarsi lighter. Head and thoracic dorsum conspicuously marked with white and red. Vertex white except median suture, discal impressions and line next to margin. Genal processes white. Thorax with 5 more or less complete white stripes margined with red. Wings hyaline except spot at tip of clavus, small one midway between this and base, black.

Structure: Body with short sparse pubescence. Head narrower than thorax. Vertex with deep discal impressions, prominent medial suture, sparsely pubescent, abruptly margined. Genal processes very long, slender, acute, divergent, longer than vertex. Antennae 1.5 times as long as width of head. Thorax quite flat for genus. Pronotum short, not depressed below vertex. Forewings broadly rounded as in *Psylla*, 2.4 times as long as wide; Rs straight, of moderate length, cubital cell larger than medial. Metatibiae with serrate basal carina, 1 outer and 3 inner apical spines. Metacoxae scarcely produced anteriorly.

Female genital segment shorter than rest of abdomen, valves subequal in length, both acute, ventral somewhat upturned.

Holotype, female, taken on a light, San Jacinto, D. F., 2240 meters, April 11, 1933, in Dampf's collection.

This species although a member of *Trioza* has the general appearance and coloration of many *Psylla*. The unique specimen is described because of its distinctness although the hind wings and most of the abdominal dorsum have been destroyed by pests.

Host: Unknown

***Trioza psyllihabitatus* n. sp.**

Figs. 41, 42.

Length to tip of folded wings 2.5 mm.

Color: General color red. Legs, genitalia, antennae and distal half of genal processes light brown. Most of head and some markings on thorax white.

Structure: Head nearly as wide as thorax. Vertex with deep discal impressions, medial suture prominent, rounded to genae. Genal processes long, slender, divergent, acute, parallel to plane of vertex, nearly as long as vertex. Antennae 1.5 times as long as width of head. Thorax moderately arched. Pronotum short, not below vertex. Forewings small, broadly rounded, 2.5 times as long as wide; Rs long, slightly sinuate, marginal cells small, medial larger than cubital. Hind wings 0.75 as long as forewings. Metatibiae with small basal spur, 1 outer and 3 inner apical spines. Metacoxae scarcely produced anteriorly.

Male genitalia large. Proctiger strongly produced caudad below apical epiphysis. Forceps as long as proctiger; in lateral view straight, tapered distally to blunt apex; in caudal view moderately stout, nearly straight, a black mesally projecting tooth at apex.

Holotype, male, swept from dense bush in pine and oak tree forest on the summit of Cerro Vista Hermosa, 2400 meters, in the Moshbiquil range near San Cristobal Las Casas, July 17, 1926.

This species in general appearance resembles the genus *Psylla*, due to the rounded forewings and only moderately arched thorax. It seems to be most nearly related to *T. mexicana*.

Host: Unknown

Holotype in Dampf's collection.

***Trioza (Megatrioza) diospyri* (Ashmead)**

Figs. 43, 44, 45.

1881 *Psylla diospyri* Ashmead, Can. Ent. 13:222.

1885 *Trioza diospyri* Riley, Proc. Biol. Soc. Wash. 2:70.

1905 *Trioza koebelei* Kirkaldy, Can. Ent. 37:290.

1910 *Trioza latipennis* Crawford, Pom. Coll. Jour. Ent. 2:230.

1919 *Megatrioza diospyri* Crawford, Phil. Jour. Sci. 15:193.

1926 *Spanioza diospyri* Enderlein, Ent. Mitt. 15:400.

1926 *Phyllopecta diospyri* Ferris, Can. Ent. 58:16.

1928 *Phyllopecta diospyri* Ferris, Can. Ent. 60:245.

1938 *Phyllopecta diospyri* Caldwell, Ohio Biol. Surv., Bull. 34:249.

1941 *Phyllopecta diospyri* Caldwell, Ohio Jour. Sci. 41:422.

1941 *Trioza koebelei* Caldwell, Ohio Jour. Sci. 41:422.

Length to tip of folded wings 4.5 mm.

Color: General color shining black. Meso and metatibiae, all tarsi, genal processes and antennae except tip, light.

Structure: Entire body sparsely clothed with long hairlike setae. Head broad but narrower than thorax. Vertex plane, with slight discal impres-

sions. Genal processes short, rounded, about 0.5 as long as vertex, slightly divergent. Antennae about 1.5 times as long as width of head. Thorax strongly arched. Pronotum strongly depressed, entirely below level of vertex. Forewings very large, almost twice as long as body, about 2.75 times as long as wide, acutely angled at apex; marginal cells unusually large, medial very large, Rs short, less than 0.5 as long as wing, straight. Hind wings very small, less than 0.5 as long as forewings. Legs long. Metatibiae without basal armature, 1 outer and 3 inner apical spines. Metacoxae produced anteriorly as raised spur larger than meracanthus.

Male genital segment small. Proctiger somewhat longer than forceps, produced caudad as large blunt lobe, anus on prominent epiphysis. Forceps almost straight in lateral view; in caudal view broad, straight basally, apical 0.3 incurved, apex with several small black teeth. Female genital segment of medium size, about 0.5 as long as rest of abdomen, valves acute, ventral up-curved to meet dorsal, latter longer, entire segment usually pointing ventrad.

As the specific name indicates this form inhabits persimmon (*Diospyros*). It is wide spread throughout the southeastern part of the United States, being limited in its occurrence by the range of its host. Mr. O. H. Swezey has compared specimens of *diospyri* with the specimens from which Kirkaldy described *Trioza koebelei* and they are identical. Apparently there was a confusion of Koebele's data as both Kirkaldy's specimens and those on which the species *anceps* is based bear the number 1780. The latter is the species which forms galls on the leaves of the avocado. Caldwell has indicated in private correspondence that the specimens which he recorded as *koebelei* are in fact *diospyri*.

Specimens are at hand bearing the following data: Cuernavaca, November 5, 1922, E. C. Smyth; Torreon, Coahuila, swept on cotton, June 19, 1930; Hacienda Alamo near Saltillo, Coahuila, June 9, 1931, swept on alfalfa; swept from flowering onions, Agricultural School near Saltillo, Coahuila, June 10, 1931; Nuevo Laredo, Tamaulipas, swept in the air at sunset on border of the river, February 6, 1934.

Previous records for Mexico are La Providencia, near Acapulco, Guerrero, G. F. Ferris and Santa Engracia, Tamaulipas, November 4, 1938, J. S. Caldwell (recorded as *Trioza koebelei*).

Host: *Diospyros virginiana* L.

Type No. 14820, United States National Museum.

***Trioza albifrons* Crawford**

Figs. 46, 47, 48.

1910 *Trioza albifrons* Crawford, Pom. Coll. Jour. Ent. 2: 231, 355.

1910 *Trioza rotundipennis* Crawford, Pom. Coll. Jour. Ent. 2: 231, 236.

1910 *Trioza similis* Crawford, Pom. Coll. Jour. Ent. 2: 231, 352.

1910 *Trioza fovealis* Crawford, Pom. Coll. Jour. Ent. 2: 233.

1911 *Trioza similis fovealis* Crawford, Pom. Coll. Jour. Ent. 3: 423, 428, 438.
Length to tip of folded wings 3 to 3.5 mm.

Color: General color from green to light yellow to brown to black. In

lighter forms only eyes, distal 0.5 of antennae and last segment of tarsi, dark. In dark forms, rim of vertex, male genitalia and usually legs, light. (Between these extremes all variations in color occur).

Structure: Head small, narrower than thorax. Disc of vertex depressed, edges carinate, protruding in front. Genal processes acute, divergent, parallel to plane of vertex, about 0.66 as long as vertex. Antennae 1.5 times as long as width of head. Thorax strongly arched. Pronotum depressed below plane of vertex. Forewings varying from angular to round apically; Rs short to long, marginal cells equal. Hind wings 0.7 as long as forewings. Metatibiae without basal armature, 1 outer and 3 inner apical spines.

Male proctiger slightly longer than forceps, basal 0.75 roundly produced caudad. Forceps stout, arched heavy, black tipped apices, anterior margin excavate near apex. Female genital segment 0.5 to 0.65 as long as rest of abdomen, valves approximately equal, almost straight to acute or subacute apices.

This species is abundant throughout North America. It inhabits *Urtica* spp. and is very closely related to *T. urticae* an old world species, the type of the genus.

Numerous specimens are at hand with the following data: Xochimilco, D. F., September 30, 1923 swept from every description of biocoenosis (including *Urtica*); Popotla, D. F., June 19, 1924, swept from weeds along a water ditch; Mixquic, D. F., April 29 and May 17, 1938, on *Urtica dioica angustifolia*; El Chico, Hidalgo, September 15, 1938, swept on weeds along the road; Lagunas de Zempoala, Morelos, June 5, 1941, swept on grass.

Host: *Urtica* spp.

Type in the Crawford Collection, United States National Museum.

***Trioza incidata* n. sp.**

Figs. 49, 50, 51.

Length to tip of folded wings 2.75 mm.

Color: General color orange red. Abdomen, except male genitalia, thoracic venter and antennae fuscous. Genae and legs lighter.

Structure: Head large, as wide as mesoscutum. Vertex plane, scarcely impressed discally, rounded down anteriorly, median suture prominent. Genal processes 0.8 as long as vertex (as long as median suture), strongly tapered, contiguous basally, somewhat divergent. Antennae about 1.66 times as long as width of head. Thorax moderately arched. Pronotum large, depressed below vertex anteriorly. Forewings 2.5 times as long as wide, roundly angled at apex; Rs long, somewhat sinuate, marginal cells equal, radular areas prominent. Hind wings over 0.66 as long as forewings. Metatibiae with large, stout basal spur, 1 outer and 3 inner apical spines. Metacoxae well developed anteriorly.

Male genitalia small. Proctiger roundly produced caudad below apical epiphysis. Forceps shorter than proctiger; in lateral view stout, straight, a deep broad oblique sulcus near apex forming a somewhat rounded antero-

lateral lobe and a longer, apically truncate process, mesal process terminating anteriorly as a sharp point; in caudal view stout basally, strongly bowed outward, narrowed to sharp, black nearly touching apices, many stout setae projecting mesad near base. Female genital segment shorter than rest of abdomen, bulbous basally, both valves very abruptly constricted to short caudal projections, dorsal valve longer than ventral, tip of each sharp.

Holotype, male **allotype**, female, 1 male and 2 female paratypes taken at a light, San Jacinto, D. F. (2240 meters), May 24 and 26, 1932. Other paratypes as follows: 1 male and 1 female taken in the same manner and same locality July 6, 1932; 1 female swept from low oak shrub, approximately 2500 meters, on slope of Monte Alto, northern part of the Valley of Mexico near Fernandez Leal, November 15, 1938; 2 males and 3 females swept from shrubs and bushes in mixed forest, Desierto de los Leones, September 23 and December 9, 1923; 1 male swept from dense shrubs on Cerro Huixtepec near San Cristobal Las Casas, Chiapas at 2600 meters June 14, 1926 seems to certainly be the same species. Another male swept from flowering plants in the Barranca de Chimalhuacan, Valley of Mexico, State of Mexico at 2300 meters, Dec. 20, 1931, is very similar except in some characters of the head and in coloration.

Host: Unknown

Holotype, allotype and paratypes in author's collection, paratypes in Dampf's collection.

The name (p. part of *incido*, L. v.—notched) alludes to the male forceps.

***Trioza mexicana* Crawford**

Figs. 52, 53, 54.

1911 *Trioza mexicana* Crawford, Pom. Coll. Jour. Ent. 3: 424, 428, 439.

1944 *Trioza mexicana* Caldwell, Ohio Jour. Sci. 44:62.

Length to tip of folded wings 3.75 mm.

Color: General color reddish brown. Males especially often chocolate brown with pale yellow markings, quite variable. Wings more or less fumose.

Structure: Head large, narrower than thorax. Vertex narrow, 0.7 as long as wide, with shallow discal impressions, anterior margin not abrupt, rounded to genae. Genal processes slender, acute, divergent apically, almost as long as medial length of vertex, 0.7 total length of vertex. Antennae from 1.6 to nearly 2 times as long as width of head. Thorax well arched. Pronotum strongly descending, not depressed below plane of vertex. Forewings large, about 2.5 times as long as wide, broadly rounded to angulate apically; Rs long, slightly sinuate, marginal cells of moderate size, about equal, radular areas on margin very prominent. Hind wings 0.77 as long as forewings. Metatibiae with small basal spur, 1 outer and 3 inner apical spines. Metacoxae slightly produced anteriorly.

Male proctiger large, roundly produced caudad, small apical epiphysis. Forceps large, in lateral view stout, turned cephalad and mesad toward apex, tips acute, in caudal view slender, nearly straight to black incurved tips, row of heavy setae on mesal margin. Female genital segment large, as long as

rest of abdomen or nearly so, valves straight, attenuate, black apically, serrate toward apex, ovipositor large, stout, blunt, exceeding valves.

At present known only from Mexico this species is quite variable in most characters. The specimens on which Crawford based the original description were taken near Cuernavaca, Morelos, on a species of *Rhus*, at 10,000 feet. Specimens at hand bear the following data:

Desierto de los Leones, *Pinus* and *Abies* forest 20 km. southwest of Mexico, D. F., swept from shrubs and bushes in the luxuriant undergrowth, July 20, 1924; same locality, from *Arbutus glandulosa*, March 29, 1925; San Jacinto, D. F., taken at light, March 19, 1933; Desierto de los Leones, swept from shrubs, May 22, 1938; Lomas de Chapultepec, near Mexico, D. F., on light, May 29, 1940 and June 1 and 5, 1941. Caldwell has recorded specimens taken on *Pocatepetl*.

Host: Unknown

Type in Crawford Collection, United States National Museum.

***Trioza mexicana minor* Tuthill**

Figs. 55, 56.

1911 *Trioza mexicana minuta* Crawford, Pom. Coll. Ent. 3:424, 429, 440.

[non] *Trioza minuta* Crawford, Pom. Coll. Jour. Ent. 2: 232, 1910.

1941 *Trioza mexicana minuta* Caldwell, Ohio Jour. Sci. 41:422.

1943 *Trioza mexicana minor* Tuthill, Ia. St. Coll. Jour. Sci. 17:576.

Length to tip of folded wings 3 mm.

This subspecies is distinguished from the typical form by its smaller size, some difference in the genal processes and the shorter female genital segment. It was originally described from Oaxaca. Specimens are at hand from scattered localities in Mexico as given below. It is also known from Arizona, United States.

Peñon Viejo, halfway between Mexico and Chapingo, swept from *Sedum dendroides* near the shore of Lake Texcoco, a characteristic xerophil vegetation, March 3, 1924. Mountain range of Tlaloc, near Chapingo, swept from *Abies*, June 15, 1924. Cordoba, Veracruz, swept in the bed of the Rio San Antonio, November 20, 1924. Desierto de los Leones, 20 km. southwest of Mexico, swept from *Baccharis* sp. in flower, February 22, 1925. Zontehuitz Mountain, north of San Cristobal Las Casas, Chiapas, swept on *Baccharis* and *Gaultheria* at 2800 meters, June 20, 1926. San Jacinto, D. F., taken at light, May 4, June 4, June 30, October 29, 1932 and April 11, 1933. Yotao, Oaxaca, in the Sierra Juarez, at light, November 15, 1937, Francisco Reyes collector. Slopes of Monte Alto, northern part of the Valley of Mexico, near Fernandez Leal, swept from low oak shrub, appr. 2500 meters, November 15, 1938.

Previous records are Mexico, D. F., September 1 and 13, 1939 (Caldwell).

Host: Unknown

Type in Crawford Collection, United States National Museum.

***Trioza mexicana curtigena* n. subsp.**

Length to tip of folded wings 2.75 mm.

Color: General color orange red. Abdomen fuscous ventrally.

Structure: Head as wide as thorax. Vertex plane, with broad discal impressions, rounded down anteriorly. Genal processes small, divergent, 0.5 as long as vertex. Antennae but slightly longer than width of head. Thorax well arched. Pronotum large, caudal margin deeply emarginate medially, nearly vertical. Forewings straight, broadly rounded, nearly 2.75 times as long as wide; Rs long, straight, marginal cells small, medial somewhat larger than cubital. Hind wings unusually large, 0.75 as long as forewings. Metatibiae with basal spur, 1 outer and 3 inner apical spines. Metacoxae scarcely produced anteriorly.

Female genital segment as long as rest of abdomen, large basally, attenuate apically; dorsal valve with styliform portion acute, spinose, somewhat upturned; ventral valve nearly as long as dorsal, upturned to acute apex.

Holotype, female, San Jacinto, D. F., 2240 meters, September 5, 1932, on light. Paratypes also collected on light at San Jacinto, D. F. as follows. 1 female, May 4, 1932; 1 female, June 4, 1932; 2 females, April 11, 1933.

The relationship of this form to *T. mexicana minor* is doubtful. Unfortunately no males are associated with any of the specimens at hand. Two mutilated males which seem to correspond to the above specimens are at hand from the mountain range of Tlaloc, near Chapingo, swept from *Abies* branches at 3000 meters, June 15, 1924. These males have genitalia very similar to *T. mexicana minor*. It is hoped that further collecting will serve to establish the status of these two entities. The subspecies *curtigena* differs from *minor* in the shorter antennae, shorter genal processes, longer wings with Rs straight and in the genitalia. The styliform portion of the female genital segment is much shorter in *curtigena* than in *minor* and is somewhat upturned giving it a quite distinctive appearance.

Host. Unknown

Holotype and paratype in author's collection, paratypes in Dampf's collection.

Genus *Paratrioza* Crawford

1910 *Paratrioza* Crawford, Pom. Coll. Jour. Ent. 2: 228, 229

1911 *Allotrioza* Crawford (*pro parte*), Pom. Coll. Jour. Ent. 3: 423, 442.

Head narrower than thorax, scarcely deflexed. Vertex very distinctly margined, anterior margin usually slightly overhanging. Genae usually produced as short, broad, padlike processes, sometimes conical, sometimes not at all produced, never spherically swollen. Clypeus visible from anterior view. Antennae slender, variable in length. Thorax moderately arched. Pronotum short, descending anteriorly. Proepisternum strongly produced laterad. Forewings membranous, elongate, acutely angled to somewhat rounded apically, venation triozone. Hind wings much shorter than forewings. Metatibiae with basal spur, 1 outer and 2 inner apical spines. Metacoxae often with anteriorly projecting process.

Logotype: *Paratrioza cockerelli* (Sulc).

Only two species are represented in the Mexican fauna. One additional species, *P. dorsalis* assuredly occurs in the northern portion of the country

as it is known from southern Arizona. *P. lavaterae*, described from California probably occurs also. *P. simila*, Caldwell, is evidently identical with *P. dubia* and *P. plummeri* seems to belong to the genus *Kuwayama*.

KEY TO THE SPECIES OF PARATRIOZA

1. Genae produced as small conical processes; caudal lobes of male proctiger shorter than axial portion **cockerelli**
- Genae produced as flattened padlike lobes; caudal lobes of male proctiger longer than axial portion **dubia**

Paratrioza cockerelli (Sulc)

Figs. 57, 58, 59.

1909 *Triozia cockerelli* Sulc, Acta Soc. Ent. Bohemicae 6:102-108.

1910 *Paratrioza ocellata* Crawford, Pom. Coll. Jour. Ent. 2: 229.

1910 *Paratrioza pulchella* Crawford, Pom. Coll. Jour. Ent. 2: 229.

1911 *Paratrioza cockerelli* Crawford, Pom. Coll. Jour. Ent. 3: 446, 448.

1925 *Paratrioza cockerelli* Ferris, Can. Ent. 57: 47-48.

1941 *Paratrioza cockerelli* Caldwell, Ohio Jour. Sci. 41:421.

Length to tip of folded wings 3 mm.

Color: General color typically black, with lighter markings varying from white to red. Vertex black except margin and transverse discal area light, dorsum of thorax with light longitudinal stripes. At least posterior portion of pronotum light. Prescutum with medial longitudinal band and horseshoe-shaped macula on each side, light. Scutum with two broad medial stripes, narrow one laterad and lateral margin, light. Posterior margin of abdominal tergites white, first one most prominently so. Extent of pattern variable, often appearing as dark markings on light ground color. Genal processes and legs usually light. Apex of antennal segments black. Wings hyaline.

Structure: Head of moderate size, narrower than thorax. Margins of vertex raised and abrupt; vertex discally impressed, medial suture prominent. Genal processes very small but distinct, divergent, acute. Clypeus visible from anterior or lateral view. Antennae 1.5 times as long as width of head. Thorax strongly arched. Pronotum strongly descending cephalad but not entirely depressed below plane of vertex. Forewings straight, roundly angular, about 2.5 times as long as wide; venation typical triozone, Rs long and sinuate. Hind wings 0.75 as long as forewings. Metatibiae with 2 inner and 1 outer apical spines, large basal spur. Caudal spur of metacoxae small, erect, straight, anterior one about same size but flattened.

Male proctiger in lateral view produced caudad as lobe of variable size and shape, from slender to almost triangular, length through lobe not greater than that of axial portion, with distinct apical epiphysis. Forceps as long as proctiger; in lateral view slightly curved cephalad apically to acute apices, flattened and somewhat incurved apically; in caudal view straight, narrow. Female genital segment short, about as long as last abdominal sternite; dorsal valve down-curved, black-tipped, acute, anal pore 0.5 total length; ventral valve shorter, black and acute at apex, slightly produced.

This important pest of potatoes and other solanaceous plants is widely distributed in western North America. Its occurrence in Mexico has been known for several years. Caldwell has recorded it from Santa Engracia, Tamaulipas, and Mexico, D. F.

Numerous specimens are at hand bearing the following data: San Jacinto, D. F., swept from weeds, September 10, 1923; Chimalhuacan, on Texcoco Lake, east of Mexico, swept from weeds in a garden, October 21, 1923; Peñon de Baño on the shore of Texcoco Lake, a small volcano with scanty xerothermic vegetation, January 31, 1926; swept from flowering potatoes, Guadalajara, Jalisco, June 11, 1927; swept from alfalfa, San Jacinto D. F., May 28 and June 17, 1929; near Maltrata, Veracruz, tomatoes, May 17, 1930; swept from flowering onions at Agricultural School near Saltillo, Coahuila, June 10, 1931; Hacienda Fresno near Torreon, Coahuila, swept on weeds bordering a cotton field June 11, 1931; swept from tomatoes, El Dorado, Sinaloa, near sea level, March 22, 1932; Ciudad Camargo, Chihuahua, on beans, May 14, 1932, E. Q. Rocha collector, San Jacinto, D. F., on light, September 29, 1932; swept from *Urtica*, Mixquic, D. F., Xochimilco region, June 18, 1938; Hacienda de La Labor (Lourdes), San Luis Potosi, swept in the kitchen garden, November 28, 1938; swept from flowering *Senecio salignus* in company with *P. dubia*, Lagunas de Zempoala, Morelos, Tonatihagua Lake, May 5, 1941; swept from weeds near the Agricultural School, Ayotzinapa, Tixtla Valley, Guerrero, 1500 meters, January 14, 1941.

Hosts: Potatoes, tomatoes, peppers and various other solanaceous plants.

***Paratrioza dubia* Tuthill**

Figs. 60, 61, 62.

1943 *Paratrioza dubia* Tuthill, Ia. St. Coll. Jour. Sci. 17:591.

1944 *Paratrioza simila* Caldwell, Ohio Jour. Sci. 44:60.

Length to tip of folded wings 3.5 to 3.75 mm.

Color: Ground color of head and thoracic dorsum dirty white, more or less suffused with red, with prominent orange to dark brown markings. Vertex with narrow anterior band, short transverse band posteriorly, latter often broken. Genae light at least basally. Antennae light, apex of segments dark. Thoracic dorsum with variable longitudinal stripes. Venter dark. Legs light. Abdomen chocolate brown, first tergite white margined, last three with light area medially. Wings somewhat fumose. Genitalia light.

Structure: Head narrower than thorax. Vertex almost twice as wide as long, margins sharply raised, discally strongly depressed, 2 foveae near caudal margin, medial suture prominent. Genae slightly produced, padlike, not conical. Antennae twice as long as width of head. Thorax well arched. Pronotum short, depressed below plane of vertex. Prescutum acute anteriorly. Forewings large, straight, angulate, 2.75 times as long as wide; Rs long, sinuate, reaching furcation of media, marginal cells about equal. Hind wings slender, 0.66 as long as forewings. Legs large, metatibiae with small single or double basal spur, 1 outer, 2 inner apical spines. Metacoxae with caudal spur of moderate size, small anterior one.

Male proctiger with large slanting caudal lobes, axis through lobes longer than axial portion, lobes enclosing forceps, anus on oblique epiphysis. Forceps shorter than proctiger; in lateral view slender, very strongly curved cephalad to sharp apices; in caudal view broad basally then slender, slightly arched to apices. Female genital segment short, ventral valve quite flat, rounded and dark apically; dorsal valve narrower, hood-shaped, overhanging, apex black.

This species is represented in the material at hand by a great many specimens. It apparently occurs on *Senecio salignus* in great numbers. This is probably the host plant as many of the specimens taken from it are quite teneral.

Chapingo, Mexico, February 25, and 26, 1924, approximately 350 specimens swept from *Senecio salignus* in full flower; same locality, March 1, 15, and 17, 1924, swept from *Senecio salignus*, approximately 240 specimens (many teneral); Peñon Viejo, halfway between Mexico and Chapingo, swept from a solitary bush of *Senecio salignus* 3 adults, March 5, 1924; Chapingo, April 9 and 23, 1924, from *Senecio salignus* (fruiting), 177 specimens; Chapingo, May 16, 1924, 53 specimens from fruiting *Senecio salignus*; Chapingo, July 11, 1924, 31 specimens from *Senecio salignus*; Desierto de los Leones, March 29, 1925, swept from *Senecio salignus*, 1 specimen; San Cristobal Las Casas, Chiapas, June 4, 1926, swept from weeds outside the village, border of a meadow in flower, 1 specimen; same locality June 9, 1926, 7 specimens. Xoloc, Mexico, swept on *Senecio salignus* in flower, March 10, 1929, 74 specimens; San Jacinto, Mexico, September 24, 1929, swept from weeds along experimental vegetable plots, 4 specimens; Tenancingo, Mexico, swept from *Senecio salignus*, March 4, 1933; swept shrubs near a point called Eella Vista, 12 km. from Mexico on the highway to Cuernavaca, September 17, 1933, 4 specimens; Telapón Mountain, Tlaloc-Ixtachihuatl range in the Valley of Mexico, swept in open pine forest, July 25, 1937, 2 specimens; Lomas de Chapultepec, suburb of Mexico, swept from weeds, April 2, 1939, 1 specimen; Texcatenco near Oxcoacac, Mexico, Lerma Valley, swept from weeds, October 5, 1939, 1 specimen; Llano Grande, base of Mount Telapón, Mexico, swept from grass and shrubs, September 29, 1940, 5 specimens; Tonatihagua Lake, Lagunas de Zempoala, Morelos, swept from *Senecio salignus*, May 5, and June 5, 1941, 20 specimens.

Caldwell has recorded this species from Carapan, Michoacan, Rio Frio, Puebla, and San Cristobal, Guatemala under the name *P. simila*. These are the only recorded specimens other than the type series from Arizona and one pair of specimens from California.

Type in Snow Collection, University of Kansas, Lawrence, Kansas.

Genus *Kuwayama* Crawford

1911 *Epitrioza* Crawford, Pom. Coll. Jour. Ent. 3: 423, 452.

[non] *Epitrioza* Kuwayama, Trans. Sapp. Nat. Hist. Soc. 3: 55, 1910.

1911 *Kuwayama* Crawford, Pom. Coll. Jour. Ent. 3: 503.

Head but slightly narrower than thorax, scarcely deflexed. Vertex not

sharply margined, rounded anteriorly. Genae roundly swollen, prominent, antennae slender, moderately long. Thorax not strongly arched. Pronotum short, descending anteriorly. Forewings membranous, elongate, acute to subacute apically, venation triozone. Hind wings slender. Metatibiae with basal spur, 1 outer and 2 inner apical spines. Male proctiger without caudal lobes. Female genital segment elongate.

Orthotype: **Kuwayama medicaginis** (Crawford)

This genus is near **Paratrioza** on the one hand and **Rhinopsylla** in the **Car-sidarinae** on the other. The genae are often produced forward between the antennae giving an appearance of a cleft head as in **Rhinopsylla**. On the basis of the head characters alone these two genera cannot be distinguished. This accounts for Crawford having placed the same species in both of these genera. With the examination of a larger number of species of **Kuwayama** it becomes apparent that the general type of genital structure of both sexes is distinctive.

The species recently described by the author as **Rhinopsylla caldwelli**, found in Florida, is properly referred to **Kuwayama**. That described as **Paratrioza plummeri** by Caldwell is probably identical with **K. longipennis** here described as new. Since no specimens of **P. plummeri** are available for comparison the name **longipennis** is used until this question can be settled with certainty.

KEY TO THE SPECIES OF KUWAYAMA

1. Antennae 2.5 times as long as width of head; clypeus very prominent,
black **oaxacensis**
Antennae not over twice as long as width of head, clypeus smaller,
not black 2
2. Length to tip of folded wings 3.25 mm. or over; forewings 3 times as
long as wide **longipennis**
Length to tip of folded wings 3 mm; forewings not over 2.75 times as
long as wide 3
3. Male forceps with prominent antero-lateral projection; dorsal valve
of female genital segment straight apically **medicaginis**
Male forceps without accessory lobe; dorsal valve of female genital
segment upturned apically **sincera**

Kuwayama medicaginis (Crawford)

Figs. 63, 64, 65.

1910 **Paratrioza medicaginis** Crawford, Pom. Coll. Jour. Ent. 2: 229.

1911 **Epitrioza medicaginis** Crawford, Pom. Coll. Jour. Ent. 3: 452.

1914 **Kuwayama medicaginis** Crawford, U. S. Nat. Mus., Bull. 85:66.

1941 **Kuwayama medicaginis** Caldwell, Ohio Jour. Sci. 41:421.

Length to tip of folded wings 3 mm.

Color: General color sordid white to yellowish. Flavous markings on vertex and thorax, latter forming incomplete longitudinal stripes. Distal tarsal segments and apical 0.63 of antennae fuscous. (Crawford writes "yellowish green throughout." This is probably the color of living and fresh specimens).

Structure: Head narrower than thorax. Vertex long, discal impressions very deep; anterior margin overhanging median ocellus, somewhat rounded down. Genae roundly swollen ventrally, not touching. Clypeus plainly visible from front. Antennae 1.6 times as long as width of head. Thorax moderately arched. Pronotum not depressed below plane of vertex. Forewings slender, straight, angulate, almost 3 times as long as broad; Rs long, somewhat sinuate, marginal cells about equal. Metatibiae with prominent basal spur, 1 outer and 2 inner apical spines. Metacoxae raised anteriorly, plate-like.

Male proctiger short, curved caudad, caudal margin roundly produced, narrow apical epiphysis. Forceps almost as long as proctiger, broad basally, narrowed to obliquely truncate apices, flattened apically, apical margin heavy, crenate, black; a prominent, acute antero-lateral projection shorter than principal portion; base heavily pubescent. Female genital segment almost as long as rest of abdomen; apical portion of ventral valve very slender, acute, dark; dorsal valve longer, roundly blunt, black apically.

This insect is moderately abundant in southwestern United States. Originally described from Colorado it has been recorded from Texas, New Mexico, Arizona and California.

Specimens at hand are from the following scattered localities in the northern part of Mexico. Monclova, Coahuila, November 22, 1909, F. C. Bishopp. Chapingo, Mexico, May 30, 1924. Ciudad Juarez, Chihuahua, swept from young Acala cotton, July 4, 1927. Torreon, Coahuila, swept from cotton, June 19, 1930. Hacienda Alamo, near Saltillo, Coahuila, swept from alfalfa with some weeds, June 9, 1931. Hacienda Fresno near Torreon, Coahuila, swept on weeds bordering a cotton field, June 11, 1931; same data except from alfalfa; same data except from corn. Hacienda Nijini, Ixtlahuaca Valley, Mexico, swept from corn, July 1, 1931. Ciudad Camargo, Chihuahua, taken from beans, May 14, 1932, E. Q. Rocha collector. Tlahualilo, Durango, September 3-17, 1923, taken in airplane traps at altitudes of from 500 to 2000 feet. Previous Mexican records are Jalapa, Veracruz (doubtful), Santa Engracia, Tamaulipas and Mexico, D. F.

Host: Unknown

Type in Crawford Collection, United States National Museum.

***Kuwayama sincera* n. sp.**

Figs. 66, 67, 68.

Length to tip of folded wings 3 mm.

Color: Dirty white with longitudinal markings on thoracic dorsum orange to chocolate brown. Typically brown on venter including clypeus and genae, sometimes light. Abdomen brown. Legs more or less embrowned.

Structure: Head small, narrower than thorax. Vertex with deep sulcus each side of prominent medial suture. Genae swollen, subhemispherical, slightly elongated. Antennae twice as long as width of head. Thorax narrow, moderately arched. Pronotum long, depressed below plane of vertex. Prescutum produced anteriorly as small epiphysis. Forewings 2.75 times as long as wide, angular; Rs long, sinuate, cubital cell larger than medial, radular areas

prominent. Hind wings large, 0.66 as long as forewings. Metatibiae with double basal spur, 1 outer and 2 inner apical spines. Metacoxae produced anteriorly as raised plate, posterior spurs large.

Male proctiger long, roundly, evenly produced caudad, with apical epiphysis. Forceps shorter than pructiger; in lateral view straight, cephalic margin excavate in apical 0.33, apex black, acute, incurved; in caudal view broad, straight, incurved apically, tips black. Female genital segment 0.5 as long as rest of abdomen; dorsal valve longer than ventral, apex styliform, upturned, ventral valve acute.

This species is similar to *Kuwayama medicaginis* in general appearance and structure. The genitalia of both sexes are very different however.

Holotype, male, **allotype**, female, 4 male and 3 female paratypes swept from low vegetation, Lomas de Chapultepec, Mexico, D. F., July 25, 1939. Additional paratypes with these data: Lomas de Chapultepec, D. F., on a yellow flowering composite, October 1, 1932; Desierto de los Leones, D. F., from a variety of plants on December 9, 1923, February 22, March 29, 1925, January 8, 1933; Chapingo, Mexico, February 25 and March 5, 1924; Cerro de Hongos, southwest of Mexico, swept from low vegetation, April 5, 1925; summit of Mount Ajusco, south of Mexico, swept from grass, treeless region, May 10, 1925, swept from *Senecio salignus* in flower, Xoloc, Mexico, March 10, 1929; swept from corn near Mexico, 1929; Cerro de Guadalupe, Valley of Mexico, on a yellow flowering composite, October 9, 1932; Presa de Dolores, Mexico, D. F., swept from flowers, *Cosmos*, *Cuphea*, *Tithonia*, etc., October 27, 1933; swept from low oak shrub on the slopes of Monte Alto near Fernandez Leal, northern part of the Valley of Mexico, November 15, 1938; swept from a lawn scattered with trees and shrubs, Chapultepec Park, Mexico, D. F., July 27, 1941; swept from flowering shrubs in mixed forest, Contreras, D. F., March 3, 1940.

Host: Unknown

Holotype, allotype and paratypes in author's collection, paratypes in Dampf's collection.

***Kuwayama oaxacensis* (Crawford)**

Figs. 69, 70, 71.

1911 *Epitrioza oaxacensis* Crawford, Pom. Coll. Jour. Ent. 3: 452, 453.

1911 *Rhinopsylla jalapensis* Crawford, Pom. Coll. Jour. Ent. 3: 490.

1914 *Kuwayama oaxacensis* Crawford, U. S. Nat. Mus., Bull. 85:66.

1941 *Kuwayama oaxacensis* Caldwell, Ohio Jour. Sci. 41: 421.

Length to tip of folded wings 3.5 mm.

Color: General color tan (probably greenish when alive). Antennae entirely dark brown. Clypeus black. Most thoracic sclerites brown margined. Pro and mesothoracic legs more or less embrowned. Abdominal dorsum brown. Amount of embrowning quite variable. Head may be entirely dark brown.

Structure: Body slender, wings large. More or less pubescence on head and body. Head narrower than thorax. Vertex with deep sulcate impressions,

strongly excavate anteriorly. Lateral ocelli on prominent ridges. Genae but slightly cut off from vertex, roundly swollen. Antennae slender, 2.5 times as long as width of head. Clypeus prominent, visible from front. Thorax well arched. Pronotum long, not depressed below plane of vertex. Forewings large, angulate, 2.6 times as long as wide; venational characters somewhat variable, Rs rarely reaching furcation of media, marginal cells nearly equal, cubital sometimes somewhat elongate. Hind wings slightly over 0.5 as long as forewings. Metatibiae with sharp basal carina terminating in small spur, 1 outer and 2 inner apical spines. Metacoxae slightly produced anteriorly.

Male proctiger long, slender, roundly produced caudad. Forceps shorter than proctiger; in lateral view straight, more or less angularly produced on cephalic margin, apex roundly truncate; in caudal view stout, slightly arched to blunt apices; apices sharp, incurved, visible only in dorsal view or by dissection. Female genital segment as long as rest of abdomen, slender; dorsal valve slender, slightly upturned apically, tip blunt, ventral valve shorter than dorsal; straight, acute.

Paratypes of both *Kuwayama oaxacensis* and *Rhinopsylla jalapensis* are at hand. The latter specimens are fully matured and darkly colored, the former is teneral. There are no structural differences evident which are not common in the large series of specimens at hand. These differences are slight variations in the venation of the forewings and in the genae. The paratypes of *R. jalapensis* are the darkest specimens of all I have seen, having the entire head almost black. In all specimens except those that are quite teneral the clypeus is black and is a very prominent feature.

In addition to the paratypes mentioned above which are from Oaxaca and Jalapa specimens are at hand with the following data: Tlalpam, D. F. swept in fallow cornfield covered with *Gnaphalium*, *Verbena*, etc., September 16, 1923; Desierto de los Leones, D. F., swept from bush (*Senecio*, *Salvia*, etc.) September 23, 1923; Chapultepec Heights, D. F., swept in the bed of a dry barranca on *Viguiera*, sp., February 5, 1924; swept from weeds and shrubs, Cinco Encinos, near Barreal, Cordoba, Veracruz, 850 meters, September 11, 1924; Coscomatepec, 30 km., north of Cordoba, Veracruz, 1580 meters, swept in former cornfield, November 30, 1924; swept from running railway between Maltrata and Alta Luz, where the railway line ascends the central plateau of Mexico, 2300 meters, October 5, 1924; slopes of San Antonio River, Cordoba, Veracruz, swept luxuriant weeds, October 19, 1924; swept shrubs and weeds from the train between Coscomatepec and Tomatlan, Veracruz, 1500 meters, November 30, 1924; swept from a lawn in Manzanillo, northeast of Cordoba, 1000 meters, December 2, 1924; Cauatla, Morelos, on light, September 2, 1937, R. Ruiz Soto collector; Rancho Palmira near Cuernavaca, Morelos, swept from luxuriant weeds, June 5, 1938; Ayotzinapa, Guerrero, between Chilpancingo and Tixtla swept from weeds and with flies swarming over a manure pile January 11, 14, 15 and 19, 1941; Mexico-Toluca road, km. 20, November 24, 1938, J. S. Caldwell; Concepcion, Guatemala, 1400 feet, C. N. Ainslie.

Host: Unknown.

Type in Crawford Collection, United States National Museum (a mutilated female), Oaxaca, August 10, 1910.

Kuwayama longipennis n. sp.

FIGS. 72, 73, 74.

Length to tip of folded wings 3.25-3.50 mm.

Color: General body color tawny. Abdomen brown dorsally, light ventrally.

Structure: Body slender. Head nearly as broad as thorax. Vertex deeply impressed discally. Genae roundly swollen. Antennae slender, almost twice as long as width of head. Eyes far forward on head. Thorax strongly arched. Pronotum small, not depressed below plane of vertex. Forewings large, slender, angulate, 3 times as long as wide; Rs slightly sinuate, marginal cells large, equal. Hind wings large, 0.66 as long as forewings. Metatibiae with very large basal spur, 1 outer and 2 inner apical spines. Metacoxae moderately produced anteriorly.

Male genitalia small. Proctiger straight, narrowed apically. Forceps nearly as long as proctiger; in lateral view stout, straight, slightly swollen midway, narrowed to slender, forward curving black tooth; in caudal view slender, straight, incurving black tooth apically. Female genital segment small, shorter than rest of abdomen; dorsal valve stout, blunt, straight; ventral valve shorter than dorsal, sharply turned up to acute apex.

Holotype, male **allotype**, female, swept from flowers of *Schinus molle*, Chapingo, D. F., May 19, 1924.

Holotype in author's collection, allotype in Dampf's collection.

Host: Unknown.

Genus *Leuronota* Crawford

1914 *Leuronota* Crawford, U. S. Nat. Mus., Bull. 85: 67.

Head narrower than thorax, scarcely or not at all deflexed. Genae produced as conical processes, porrect. Antennae slender, long. Eyes hemispherical. Thorax scarcely arched. Pronotum flat, long, on same plane as vertex and prescutum, produced cephalad medially as blunt epiphysis, very narrow. Proepisterna very large, visible in dorsal view as prominent quadrate lateral processes. Prescutum flat with small medial anterior epiphysis. Mesopleurites strongly developed. Forewings long, slender, angulate, venation triozine. Legs long. Metatibiae with basal spur, 1 outer and 2 or 3 inner apical spines.

Orthotype: *Leuronota maculata* (Crawford)

This genus is quite distinct from the other genera of Triozinae found in the Americas. Members are known to occur in the Orient and Pacific Islands as well as both North and South America. In addition to the two species treated here, which have been found in Mexico, two others are known from Central America; *L. acutipennis* Crawford, described from Nicaragua and *L. magna* Laing from Panama.

KEY TO SPECIES OF LEURONOTA

1. Forewings with variable maculation formed of small brown dots *maculata*
Forewings uniformly brown except for a pale area along costal border
..... *michoacana*

Leuronota maculata (Crawford)

Figs. 75, 76, 77.

1910 *Trioza maculata* Crawford, Pom. Coll. Jour. Ent. 2: 230, 349.1911 *Allotrioza maculata* Crawford, Pom. Coll. Jour. Ent. 3: 444, 446.1914 *Leuronota maculata* Crawford, U. S. Nat. Mus., Bull. 85:68.1928 *Leuronota maculata* Ferris, Can. Ent. 60: 240.

Length to tip of folded wings 3.25 to 4 mm.

Color: General color dirty white to brown, abdomen darker. Forewings with numerous small brown dots forming maculae as figured, amount of maculation quite variable.

Structure: Entire body more or less pubescent. Head narrower than thorax, not deflexed. Vertex almost plane, discal foveae more or less prominent. Genal processes short, blunt, divergent apically, about 0.5 as long as vertex, somewhat deflexed from plane of vertex. Antennae slender, 2.5 times as long as width of head. Clypeus large, visible in cephalic view. Thorax scarcely arched. Pronotum flat, above plane of vertex, acute epiphysis medially on anterior margin fitting into excavate posterior margin of vertex. Prescutum broad, lateral margins long. Forewings slender, 3 times as long as wide or slightly over, roundly angulate; Rs straight then arched to costal margin, cubital cell larger than medial. Metatibiae with 1 outer and 3 inner apical spines.

Male proctiger of medium length, rather stout, straight, anal pore opening antero-dorsally. Forceps very short; in lateral view broad, produced dorso-cephalically as long acute lobes; in dorso-caudal view broad, flattened, arched to black-tipped apices. Female genital segment 0.5 as long as rest of abdomen, thick dorso-ventrally; dorsal valve somewhat hoodshaped, exceeding ventral, ventral margin of latter straight for about 0.5 its length then sharply upturned to acute apex.

One specimen, female, Monterey, Nuevo Leon, November 25, 1909, F. C. Bishopp is in the U. S. National Museum. It has also been recorded from Sihuatenajo, Guerrero by Ferris, both nymphs and adults occurring on *Celtis iguanea*.

Host: *Celtis* spp.

Type in Crawford Collection, United States National Museum.

Leuronota michoacana Ferris

Figs. 78, 79.

1928 *Leuronota michoacana* Ferris, Can. Ent. 60:241.

Length to tip of folded wings 4 mm.

Color: General color dark brown with pale markings on head and thorax and pale area along costal border of forewing.

Structure: Head narrower than thorax, only slightly deflexed. Genal processes slightly below plane of vertex, acute and quite divergent, about 0.5 as long as vertex. Antennae slender, 2.5 times as long as width of head. Thorax flat. Pronotum flat, not at all depressed, with small median epiphysis. Forewings 3 times as long as wide, straight, bluntly pointed. Hind wings with venation well developed, entire surface beset with minute points, 0.75 as long as forewings. Metatibiae with serrate basal carina, 1 outer and 3 inner apical spines.

Male proctiger straight, truncate apically. Forceps shorter than proctiger, in lateral view straight for short distance at base then curved cephalad and dorsad, tapering to blunt tip. Female genital segment short and blunt; dorsal valve longer than ventral, downturned to rounded apex, circum-anal pore ring of double row of pores; ventral valve upturned, acute.

Known only from the type series which was collected at Chinicuila, Michoacan, February 1926 by G. F. Ferris. The adults were taken in company with nymphs both of which Ferris has described and figured in detail. I have examined some of this type material through the courtesy of G. F. Ferris.

Host: Unknown.

Genus *Metatrioza*

1939 *Metatrioza* Tuthill, Bull. Brooklyn Ent. Soc. 34: 53.

Head large, at least as broad as thorax. Vertex with sharp anterior and posterior margins, strongly concave between eyes, medial suture prominent. Genal processes not contiguous. Clypeus very small. Dorsum of thorax rather broad and flat, pronotum not depressed below head. Forewings with triozine venation, cubital cell very large. Metatibiae with large basal spur, 1 outer and 2 inner apical spines.

Orthotype: *Metatrioza pubescens* Tuthill.

Although not recorded from Mexico this genus is included because it undoubtedly occurs in the northern portion of the country. The only described species is known only from the type series which was collected in southern Arizona, in the Baboquivari Mountains.

Genus *Ceropsylla* Riley

1885 *Ceropsylla* Riley, Proc. Biol. Soc. Wash. 2:76.

Head narrower than thorax. Vertex somewhat rounded or flat with deep sulci, overhanging median ocellus, portion bearing lateral ocelli raised. Genae produced as short blunt processes extending somewhat forward, a second small rounded processes next eye, below antennal insertion. Antennae slender, long, arising close together and far down on genae. Eyes hemispherical, very large. Thorax strongly arched. Pronotum very short, vertical, depressed below vertex and prescutum. Proepisternum produced laterad, plate-like. Prescutum strongly arched. Mesopleurites strongly developed, episternum very large, swollen. Forewings large, membranous, angulate apically, basal vein very long, parallel to costa, cubitus branching separately, R short to obsolete, R₁ rather long, Rs short, cubital cell larger than medial, no pterostigma.

Hind wings much shorter than forewings. Metatibiae with basal spur, 1 outer and 2 inner apical spines.

Haplotype: *Ceropsylla sideroxyli* Riley

The characters of the head and forewing will serve to distinguish this from the other genera of *Triozinae*. The location of the antennal insertion is quite distinctive, being far down on the genal processes. The venation of the forewing is distinct. The very long basal vein and the separate branching of cubitus from the basal vein are the most striking features. The branching of the basal vein does not approximate a trichotomous condition, the common stem of R and M being quite long.

KEY TO THE SPECIES OF CEROPSYLLA

1. Vertex with deep discal sulci, female genital segment longer than rest of abdomen 2
Vertex without deep discal sulci, female genital segment shorter than rest of abdomen *sideroxyli*
2. Length to tip of folded wings 2.25 mm; vertex uniformly black *discrepans*
Length to tip of folded wings 3.25 mm; vertex light except discal sulci *pulchra*

Ceropsylla sideroxyli Riley

Figs. 80, 81, 82.

1885 *Ceropsylla sideroxyli* Riley, Proc. Biol. Soc. Wash. 2:76.

1928 *Ceropsylla sideroxyli* Ferris, Can. Ent. 60:245.

Length to tip of folded wings 4 mm.

Color: General color green to yellow. Front of head between antennae, including genal processes, prescutum and scutum dark brown. Antennae dark. Wings hyaline.

Structure: Dorsum with short pubescence. Head small, narrower than thorax. Vertex very small, rounded downward both posteriorly and anteriorly, except over median ocellus. Eyes very large. Lateral ocelli on raised prominences, far forward, almost midway of eyes. Genae separated medially to above bases of antennae, below antennae genae produced into short, bluntly rounded processes. Antennae 1.8 times as long as width of head, arising far down on genae and close together. Thorax strongly arched. Pronotum depressed below plane of vertex. Prescutum large, rounded anteriorly, as long as wide. Forewings long, slender, acutely angled, 3 times as long as wide; basal vein very long, R and M with common stem, R obsolete, Rs very short, straight, cubital cell larger than medial. Metatibiae with small basal spur, 1 outer and 2 inner apical spines. Metacoxae with posterior spur of moderate size, anteriorly somewhat produced but not spiniform.

Male proctiger produced caudad as broad rounded lobe. Forceps shorter than proctiger; in lateral view slender, slightly curved cephalad, short, slender, curved process near base on anterior margin; in caudal view slender to

spatulate apices. Female genital segment longer than preceding sternite; ventral valve very broad, slightly sinuate to medial, broad, truncate tooth; dorsal valve exceeding ventral, narrower, blunt.

Originally described from Florida, United States this species has previously been recorded from Zacatula, Guerrero, near the mouth of the Balsas River by Ferris. This record was based upon nymphs taken from "*Sideroxylon* sp." One specimen is at hand from Esmerelda, Chiapas, collected November 18, 1930.

Type no. 695 United States National Museum.

Host: *Sideroxylum foetidissimum* Jacq.

Ceropsylla discrepans n. sp.

Figs. 83, 84.

Length to tip of folded wings 2.25 mm.

Color: General color dark brown. Legs white. Wings hyaline. Abdomen yellow ventrad.

Structure: Head large, wider than thorax. Caudal margin of vertex strongly arcuate, 2 deep discal sulci, median suture prominent, bulging anteriorly over antennal insertions. Genae produced as short, blunt contiguous lobes. Eyes very large. (Antennae missing from specimen at hand). Thorax well arched, dorsum punctate. Pronotum strongly depressed, almost invisible in dorsal view. Prescutum bluntly rounded anteriorly. Forewings slender basally, much broader toward apex, 2.25 times as long as wide, very obtusely angular; $R + M + Cu$ long, R and M with common petiole, Rs short, curved to costa, cubital cell larger than medial. Hind wings 0.66 as long as forewings. Legs long, slender. Metatibiae with very small serrate carina basally, 1 outer and 2 inner apical spines. Metacoxae produced anteriorly as raised plates.

Female genital segment longer than rest of abdomen, straight, evenly narrowed from base, valves almost equal, both sharp apically.

Described from one female taken at a light by Dr. R. Nettel at Finca "La Fortuna", Chiapas, October 25, 1938. This holotypic specimen is in Dampf's collection.

Host: Unknown

Ceropsylla pulchra n. sp.

Figs. 85, 86

Length to tip of folded wings 3.25 mm.

Color: General color fulvus with brown markings, most sclerites brown margined. Vertex light yellow with discal sulci dark brown. Legs nearly white. Wings hyaline.

Structure: Head wider than thorax. Vertex strongly concave caudad, discal sulci prominent, overhanging antennal insertions. Genae produced as short, blunt, contiguous processes. Eyes very large. (Antennae lacking from specimen at hand). Thorax moderately arched. Pronotum very strongly de-

pressed. Prescutum broadly rounded anteriorly. Forewings short, 2.25 times as long as wide, very obtusely angular; basal vein long, R and M with common petiole, Rs moderately long, curved to costa, cubital cell larger than medial. Hind wings large, 0.7 as long as forewings. Metatibiae with very small serrate basal carina, 1 outer and 2 inner apical spines.

Female genital segment longer than rest of abdomen, very slender, valves equal, attenuate to sharp apices.

This species resembles *C. discrepans* very much but differs from it in the larger size, color, and the much more slender and attenuate female genital segment. It is quite probable that the males will show additional differences when they become known.

Described from a unique female collected at light by J. Parra at El Palenque, Chiapas, in virgin mountain forest, March 5, 1931. Type in Dampf's collection.

Host: Unknown.

Genus *Myrmecephala* n. g.

Head narrower than thorax, short. Vertex short, smoothly rounded to sides and to genae, medial suture distinct. Genae produced as large bluntly conical processes longer than vertex. Eyes small, hemispherical. Antennae slender, moderately long, pronotum vertical, scutum flat. Forewings slender, venation triozone, basal vein long, Rs very short, medial cell larger than cubital. Metatibiae with 1 outer and 3 inner apical spines.

Generotype: *Myrmecephala prima* n. sp

The appearance of the head of the species on which this genus is based is quite suggestive of the head of an ant. The name is derived from the Greek nouns *myrmex*—ant and *cephala*—head. The smooth bulging vertex continuous with the genae will serve to distinguish it from the other genera of Triozinae. This genus shows very strong affinities to *Triozoida* but the armature of the apex of the metatibiae is typical triozone and but very slightly developed.

EXPLANATION OF PLATE I

FIG.

1. *Trioza magnoliae* female cauda.
2. *Trioza magnoliae*—forewing.
3. *Trioza magnoliae*—male cauda.
4. *Trioza bifurca*—female cauda.
5. *Trioza bifurca*—forewing.
6. *Trioza bifurca*—male cauda.
7. *Trioza minuta* var. *arizonae*—female cauda.
8. *Trioza minuta* var. *arizonae*—male cauda.
9. *Trioza minuta* var. *arizonae*—forewing.
10. *Trioza rubra*—female cauda.
11. *Trioza rubra*—male cauda.

FIG.

12. *Trioza rubra*—forewing.
13. *Trioza russellae*—male cauda.
14. *Trioza russellae*—female cauda.
15. *Trioza russellae*—forewing.
16. *Trioza anceps*—forewing.
17. *Trioza anceps*—female cauda.
18. *Trioza inusitata*—female cauda.
19. *Trioza inusitata*—forewing.
20. *Trioza bella*—forewing.
21. *Trioza bella*—male cauda.
22. *Trioza dampfi*—male cauda.
23. *Trioza dampfi* female cauda.
24. *Trioza dampfi*—forewing.

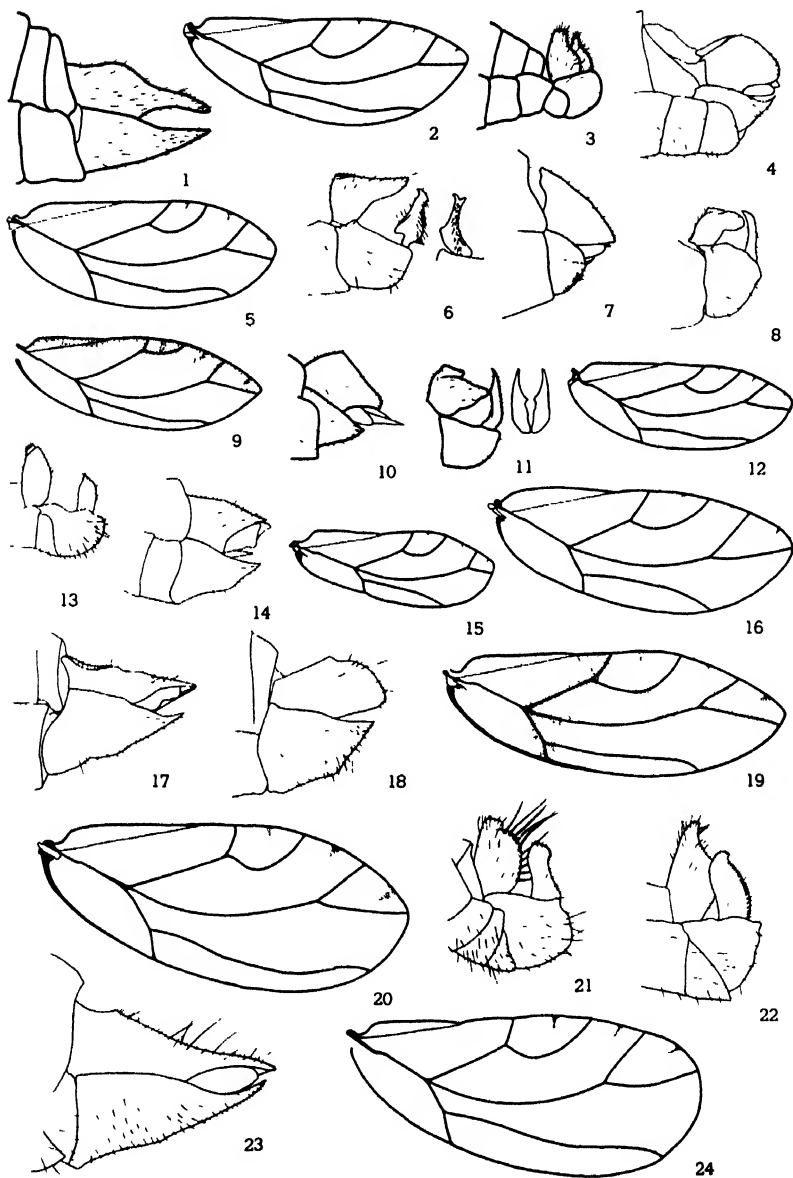


PLATE I

***Myrmecephala prima* n. sp.**

Figs. 87, 88, 89, 90.

Length to tip of folded wings 3.5 mm.

Color: Head, pro and mesothorax shining black. Metathorax, abdominal sternites, proximal segments of legs yellow. Abdominal tergites dark brown. Antennae white except 3 terminal segments black. Forewings hyaline except basal vein and R with bordering membrane dark brown, anal margin near base also embrowned. Hind wings hyaline.

Structure: Head small, vertex pubescent, short, caudal margin straight, without discal impressions, smoothly rounded to genae. Genae produced as large, straight, blunt processes, separate from base, longer than vertex in dorsal view, 0.5 as long as width of vertex. Clypeus small, not visible from front. Eyes small, hemispherical. Antennae slender, 3 times as long as width of head. Thorax strongly arched, sparsely pubescent, punctate. Pronotum short, very strongly depressed below vertex. Forewings acutely angulate, 3 times as wide as long, anal margin straight, costal margin evenly arcuate; basal vein long, furcation not quite trichotomous, Cu branching off somewhat before R and M, Rs short, arched to costa, not reaching furcation of M, medial cell slightly larger than cubital. Hind wings small, 0.6 as long as forewings. Metatibiae with serrate basal carina, 1 outer and 3 inner apical spines. Metacoxae raised anteriorly.

Male genitalia small, proctiger short, strongly produced caudad, with prominent apical epiphysis. Forceps shorter than proctiger, in lateral view stout, flaring to rounded apex; in caudal view slender, nearly straight; in dorsal view long, black margined, a small mesally projecting tooth at each end. Female genital segment 0.66 as long as rest of abdomen, straight; dorsal valve straight, acute; ventral valve shorter than dorsal, slender and upturned apically.

Holotype, male, **allotype**, female, 2 male and 2 female paratypes collected at San Pedro de Montes de Oca, Costa Rica, by C. H. Ballou on December 17, 1933 and February 3, 1915, taken on *Ipomoea tiliacea* (Wild.), sweet potato and *Tabernaemontana bignoniaceflora* Miers. One male paratype swept from flow-

EXPLANATION OF PLATE II

FIG.

25. *Trioza grandipennis*—female cauda.
26. *Trioza grandipennis*—forewing.
27. *Trioza grandipennis*—male cauda.
28. *Trioza nigriconus*—forewing.
29. *Trioza nigriconus*—male cauda.
30. *Trioza maritima*—forewing.
31. *Trioza maritima*—male cauda.
32. *Trioza maritima*—female cauda.
33. *Trioza collaris*—female cauda.
34. *Trioza collaris*—male cauda.
35. *Trioza collaris*—forewing.

FIG.

36. *Trioza proximata*—male cauda.
37. *Trioza proximata*—female cauda.
38. *Trioza nigriscutum*—forewing.
39. *Trioza nigriscutum*—male cauda.
40. *Trioza longigenae*—forewing.
41. *Trioza psyllihabit* male cauda.
42. *Trioza psyllihabit*—forewing.
43. *Trioza diospyri*—forewing.
44. *Trioza diospyri*—male cauda.
45. *Trioza diospyri*—female cauda.

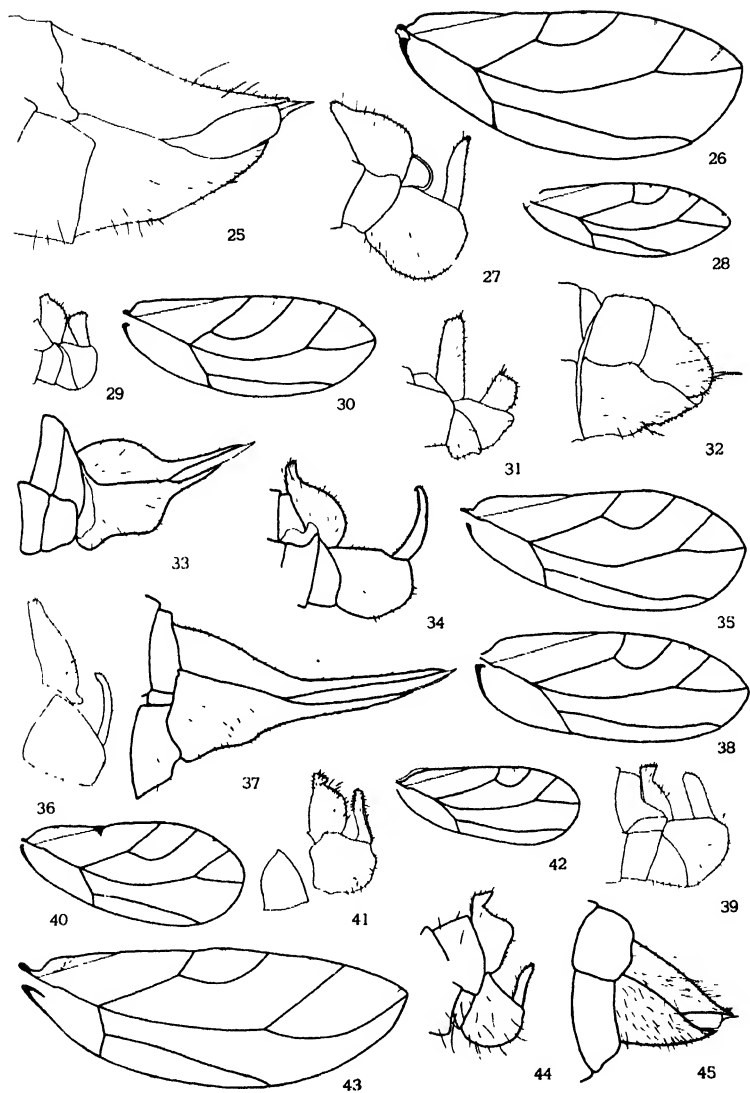


PLATE II

ering *Convolvulus* near the shore of the lake at Tuxpan near Iguala, Guerrero, Mexico, December 9, 1929, Alfonso Dampf.

Holotype, no. 56963 U. S. N. M., allotype and paratypes in United States National Museum, one pair in author's collection, Mexican specimen in Dampf's collection.

Genus *Triozoida* Crawford

1911 *Triozoida* Crawford, Pom. Coll. Jour. Ent. 3: 491.

Head narrower than thorax. Vertex smooth, concave between eyes, somewhat bulging anteriorly over median ocellus, lateral ocelli on raised areas. Median ocellus visible only from front. Genae continuous with vertex, produced as large, stout, widely separated processes. Antennae moderately long, not over twice as long as width of head. Thorax broad, well arched. Forewings long, straight, acutely angled; branching of R, M and Cu from basal vein variable. Hind wings large. Legs short, stout. Metatibiae with 2 or 3 outer and 2 or 3 inner apical spines, variable.

Orthotype: *Triozoida johnsonii* Crawford.

Several characters serve to distinguish this genus from *Ceropsylla* to which it was referred by Crawford. Chief of these are the genae, the wings and the metatibiae. The genal processes are large and are widely separated whereas in *Ceropsylla* they are short and appressed. The venation of the forewings differs in that the branching of the basal vein is trichotomous or very nearly so, this character is quite variable but the common petiole of R and M or M and Cu is not as pronounced as in *Ceropsylla*. The prescence of more than one spine on the outer margin of the apex of the metatibiae serves to distinguish this group from all of the other known genera of the Triozinae. These metatibial spines are large and stout.

Triozoida johnsonii Crawford

Figs. 91, 92, 93.

1911 *Triozoida johnsonii* Crawford, Pom. Coll. Jour. Ent. 3: 492.

1914 *Ceropsylla johnsonii* Crawford, U. S. Nat. Mus., Bull. 85: 103.

EXPLANATION OF PLATE III

FIG.

46. *Triozia albifrons*—female cauda.
47. *Triozia albifrons*—forewing.
48. *Triozia albifrons*—male cauda.
49. *Triozia incidata*—forewing.
50. *Triozia incidata*—female cauda.
51. *Triozia incidata*—male cauda.
52. *Triozia mexicana*—forewing.
53. *Triozia mexicana*—male cauda.
54. *Triozia mexicana*—female cauda.
55. *Triozia mexicana minor*—female cauda.
56. *Triozia mexicana minor*—male cauda.
57. *Paratriozia cockerelli*—forewing.
58. *Paratriozia cockerelli*—male cauda.

FIG.

59. *Paratriozia cockerelli*—female cauda.
60. *Paratriozia dubia*—forewing.
61. *Paratriozia dubia*—female cauda.
62. *Paratriozia dubia*—male cauda.
63. *Kuwayama medicaginis*—male cauda.
64. *Kuwayama medicaginis*—forewing.
65. *Kuwayama medicaginis*—female cauda.
66. *Kuwayama sincera*—female cauda.
67. *Kuwayama sincera*—male cauda.
68. *Kuwayama sincera*—forewing.
69. *Kuwayama oaxacensis*—female cauda.
70. *Kuwayama oaxacensis*—forewing.
71. *Kuwayama oaxacensis*—male cauda.

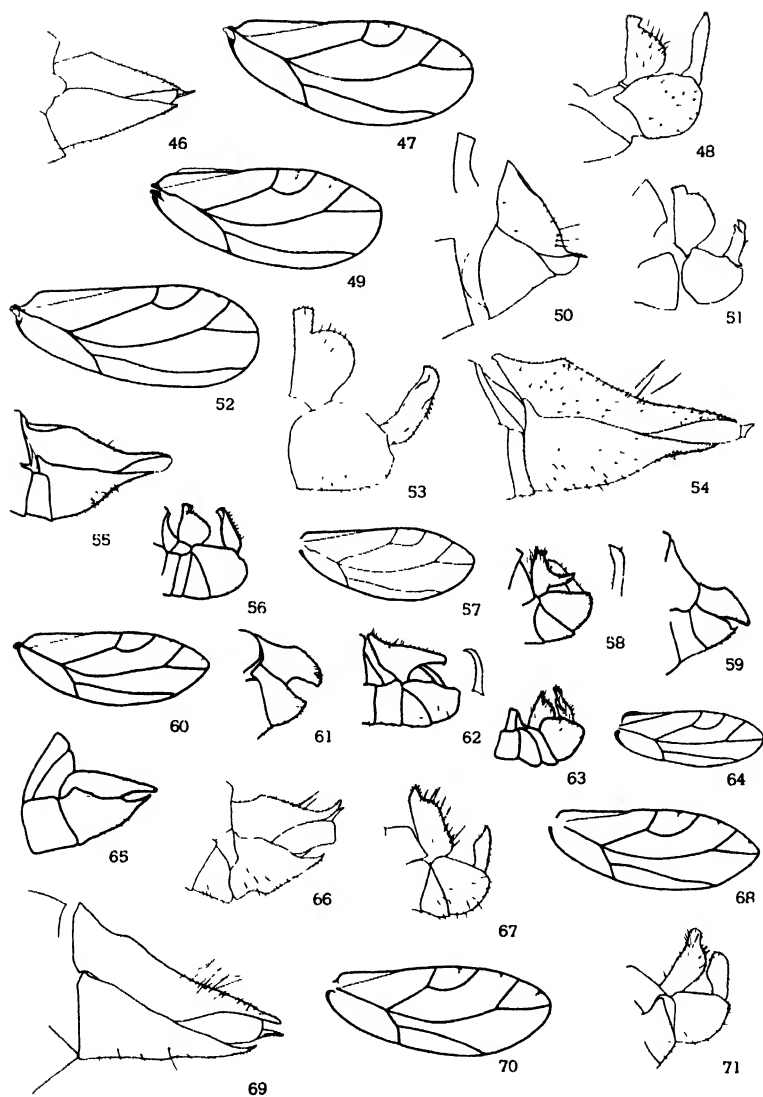


PLATE III

1925 *Ceropsylla johnsonii* Crawford, Broteria, Ser. Zool., 22:64.

1941 *Ceropsylla johnsonii* Caldwell, Ohio Jour. Sci., 41:422.

Length to tip of folded wings 4.5 mm.

Color: General color light brown. Head dark brown to black including antennae and clypeus. Thorax yellowish ventrad. Pro and meso tibiae and tarsi dark. Forewings hyaline except narrow brown margin along basal vein and R to its furcation.. Hind wings hyaline.

Structure: Head narrower than thorax. Vertex pubescent, strongly concave between eyes, protruding mesally over median ocellus, medial suture prominent, lateral ocelli on raised areas. Eyes large. Genae produced as large blunt processes, separate from base, 0.6 as long as dorsal aspect of vertex. Antennae slender, arising far down on genae, twice as long as width of head. Thorax strongly arched, broad, dorsum sparsely pubescent. Pronotum long, vertical. Mesopleurites strong developed. Forewings straight, tapered to acute apex, 3 times as long as wide; basal vein short, Rs moderately long, somewhat sinuate, medial cell much larger than cubital. Hind wings 0.6 as long as forewings. Legs short, stout. Metatibiae with basal spur, 2 or 3 outer and 3 inner apical spines. Metacoxae produced anteriorly, somewhat raised.

"Male—Forceps almost as long as anal valve (proctiger), simple, converging uniformly from base to tip, arcuate, toothed at apex, rather densely pubescent; anal valve with a short, subacute lobate process caudad from subapical portion of axis, pubescent", Crawford. Female genital segment shorter than rest of abdomen, valves equal; dorsal valve straight, blunt; ventral valve upturned to sharp apex.

Originally described from one male collected at Belize, British Honduras this species has been recorded from Valles, San Luis Potosi, by Caldwell. One female in the material at hand was collected at Finca Vergel, Chiapas, May 28, 1935 by Alfonso Dampf. It has been compared with the type in the United States National Museum. Crawford assigned a female from Sao Paulo, Brazil to this species but without description of the genitalia.

Host: Unknown.

EXPLANATION OF PLATE IV

FIG.

72. *Kuwayama longipennis*—female cauda.
73. *Kuwayama longipennis*—male cauda.
74. *Kuwayama longipennis*—forewing.
75. *Leuronota maculata*—male cauda.
76. *Leuronota maculata*—female cauda.
77. *Leuronota maculata*—forewing.
78. *Leuronota michoacana*—female cauda.
79. *Leuronota michoacana*—forewing.
80. *Ceropsylla sideroxyli*—forewing.
81. *Ceropsylla sideroxyli*—female cauda.
82. *Ceropsylla sideroxyli*—cephalic aspect of head.
83. *Ceropsylla discrepans*—female cauda.

FIG.

84. *Ceropsylla discrepans*—forewing.
85. *Ceropsylla pulchra*—female cauda.
86. *Ceropsylla pulchra*—forewing.
87. *Myrmecephala prima*—cephalic aspect of head.
88. *Myrmecephala prima*—male cauda.
89. *Myrmecephala prima*—forewing.
90. *Myrmecephala prima*—female cauda.
91. *Triozoida johnsonii*—female cauda.
92. *Triozoida johnsonii*—forewing.
93. *Triozoida johnsonii*—cephalic aspect of head.

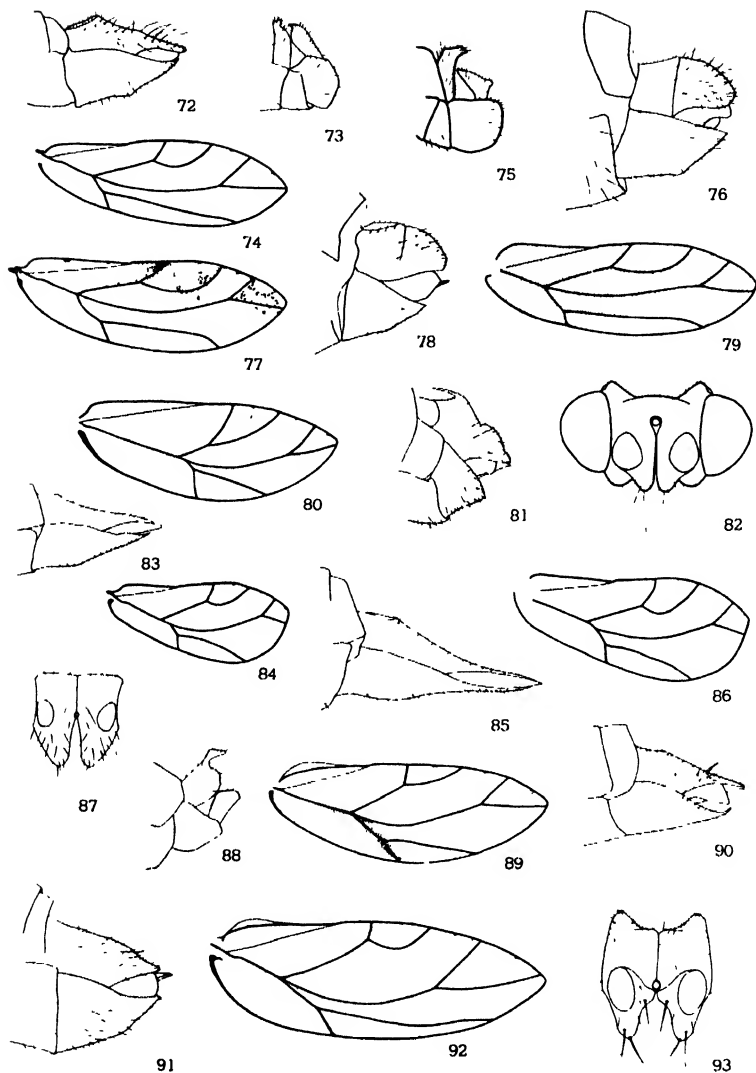


PLATE IV

THE GENUS *LACCOCERA* VAN DUZEE (Homoptera: Delphacidae)

LAWRENCE R. PENNER

University of Connecticut, Storrs, Connecticut*

The genus *Laccocera*, with *L. vittipennis* as genotype, was erected by Van Duzee in 1897 for the reception of three species of fulgid leafhoppers, namely, *L. vittipennis*, *L. zonata*, and *L. obesa*. The only other comprehensive paper on the genus was by Crawford, in 1914, in which he retreated the species described by Van Duzee and added *L. bicornata* and *L. zonata* var. *flava*. The studies presented here are the results of an attempt to arrange the accumulated material belonging to the genus on the basis of the available publications. Three species, *L. oregonensis*, *L. minuta*, and *L. vanduzeei*, are described as new to science and *L. zonata* var. *flava* is raised to specific rank. Type study has revealed that *L. bicornata* is a synonym of *L. zonata*.

The genus is found in the temperate zone, and has not been recorded from any other than the Western Hemisphere. Its range involves the states of New York, New Hampshire, Michigan, Washington, Oregon, Idaho, Utah, Wyoming, North and South Dakota, Minnesota, Kansas, Colorado, Arizona, Texas, and Nevada, and the provinces of Quebec, Ontario, Saskatchewan, and British Columbia, Canada. Members of the genus feed on various grasses, e.g., *vittipennis* has been collected on wheat.

Although Van Duzee associated his genus *Laccocera* with the Old World genera, *Delphacinus* Fieber (1866) and *Eurysa* Fieber (1866), a study of genotypes, *D. mesomelas* (Boh.), and *E. lineata* (Perr.), failed to reveal any very close relationship between them. From these two genera, *Laccocera* may be differentiated by the presence of pits on various parts of the body. On the basis of the presence of pits in the adult stage, *Laccocera* is related to *Achorotile* Fieber (1866) and *Jassidaeus* Fieber (1866) but is easily distinguished from these genera by the single median carina on the frons.

Characteristics common to all species of the genus *Laccocera* Van Duzee are as follows: Head large, about as wide as pronotum, though sometimes wider, eyes extending over the pronotum for about one half its length. The vertex is nearly square or broader than long, with carinae separating the disc into five distinct cells, two of which are caudal, two lateral, and one median. The anterior margin of the vertex is truncate or convex as viewed dorsally. The frons is broad and marked by a median carina which forks near the apex of the vertex, the lateral compartments separated by this carina containing several macroscopic rounded pits, typically six or seven.

* Contribution from the Department of Entomology, University of Kansas, and the Division of Entomology and Economic Zoology, University Farm, St. Paul, Minnesota.

The outer carinated margin of the frons, the vertex, pronotum, scutellum, dorsum, and venter of the abdomen are also pitted. The pronotum is short, considerably broader than long, with its posterior margin emarginate. The pronotum and scutellum are tricarinate and the scutellum is large. The anterior and middle tibiae are somewhat flattened. Brachypterous forms are present in all known species.

Two distinct groups of species may be distinguished within the genus. One group includes *L. vittipennis* Van Duzee, *L. minuta* sp. nov., and *L. vanduzeei*, sp. nov. In this group the species are not highly colored and the aedeagus is not a very elaborate structure. The other group holds the rest of the species. They are usually marked with red and/or yellow and the males have a more elaborate aedeagal structure, i.e., equipped apically with serrations or recurved processes not found in the first group.

If one is well acquainted with the genus, the external characters will suffice in separating the species. The main characteristics upon which the species have been separated, however, are the male genitalia and the structure of the head. The characters presented by the aedeagus, genital styles, and processes of the 10th abdominal segment of the male are sufficient for specific determination. These essential parts are usually available without internal dissection, although this method of study may be used as a last resort. As far as the head is concerned, the division of the vertex by carinae into five distinct cells, the shape and pitting of the frons, the margins of the vertex, have all proved characters of some importance. Size and general shape will also help separate the species. Color and wing venation are unreliable. Despite the fact that collectors often discard them as nymphs, the brachypterous forms studied far outnumber the macropterous ones. Consequently, the brachypterous males have been selected for description in this paper unless stated otherwise and other forms of polymorphic forms are to be considered identical with specified exceptions.

ACKNOWLEDGMENTS

Appreciation is expressed to Dr. Kathleen C. Doering of the Department of Entomology, University of Kansas, who was instrumental in starting the writer on this work many years ago; to Dr. Clarence E. Mickel of the Division of Entomology and Economic Zoology, University Farm, St. Paul, Minnesota, under whose direction the work was continued; to Dr. P. W. Oman, of the Bureau of Entomology and Plant Quarantine, for the loan of valuable material for comparisons and notes not available to me; also to Dr. R. H. Beamer, University of Kansas, Dr. J. Chester Bradley, Cornell University, Maurice T. James, Colorado State College, Dr. George F. Knowlton, Utah State Agricultural College, Dr. Frank E. Lutz, American Museum of Natural History, Dr. H. S. Scullen, Oregon State Agricultural College, and Dr. H. C. Severin, South Dakota State College, for loan of valuable material from the museum collections at their institutions.

KEY TO SPECIES

1. Vertex considerably broader than long; median cell of vertex either not angled anteriorly or blunty so 2
 Vertex square or but slightly broader than long; median cell of vertex sharply angled anteriorly 4
2. Body length less than 1.5 mm. to tip of abdomen. Median cell of vertex oblongate; styles quite short; aedeagus slender and but slightly curved *L. minuta* sp. nov.
 Body length greater than 1.5 mm. to tip of abdomen. Median cell of vertex hexagonal or rounded anteriorly; styles long; aedeagus considerably curved 3
3. Anterior margin of vertex rounded; lateral margins of median cell of vertex nearly parallel, rounded anteriorly; pronotum not as wide as head; genital styles shorter and obliquely truncate.
 *L. vanduzeei* sp. nov.
 Anterior margin of vertex straight; median cell hexagonal; pronotum about as wide as head; genital styles long and pointed at tip *L. vittipennis* Van Duzee
4. Median carinae of vertex meet abruptly below apex; genital styles short; aedeagus blunt, barbed *L. obesa* Van Duzee
 Median carinae of vertex meet at or before apex; genital styles long; aedeagus long, either spatulate or hooked at tip 5
5. Six prominent pits in each compartment of frons 6
 Seven prominent pits in each compartment of frons; aedeagus with process before tip resembling blade-shaped hook; processes of tenth abdominal segment long and curved *L. zonata* Van Duzee
6. Aedeagus lobed at tip; anterior lateral margins of median cell of vertex straight *L. flava* Crawford
 Aedeagus hooked at tip about four serrations on ventral margin in front of hook; anterior lateral margins of median cell of vertex narrowed in middle *L. oregonensis* sp. nov.

Laccocera minuta sp. nov.

(Plate III, figs 10, 11, 11a, 12, 13, 13a; Plate V, fig 22)

This species is the smallest in the genus. It is related to *vittipennis* and to *vanduzeei* but is different in that the genital styles are very short, being about one half as long as in *vittipennis* and *vanduzeei* and the aedeagus is more slender and less curved. The three middle pits in each compartment of the frons form a cluster; the median cell of the vertex is almost parallel-margined and rounded anteriorly.

Brachypterous male

Length; to tip of abdomen 1.4 mm., to tip of forewing, 0.9 mm., of forewing, 0.5 mm.

Structure: Vertex approximately five-sixths of width; cephalic margin

rounded and caudal margin somewhat emarginate; median cell not distinctly hexagonal but posterior margin more angled than in other species; lateral cells large, somewhat broader through the middle with two pits present in each cell near anterior mesal area; caudal cells proportionately near size of lateral cells; anterior margins of vertex tend to curve outward at edges; lateral margins almost parallel. Pronotal length about one third width, deeply emarginate behind; lateral carinae with anterior ends approximating caudo-mesal angles of eyes, posterior ends diverging laterally, marked below by series of small pits; median carina faint; scutellum length greater than half its width; median carinae faintly distinct, almost straight; frons with greatest width above middle, posterior margin about twice as wide as anterior margin; length about one half greater than width; each of the two compartments with seven pits, two located anteriorly, three along the lateral margin, and two in the central area, this arrangement bringing three together in the middle to form a cluster.

Color: Similar in most respects to *vittipennis* and *vanduzeei*, vertex, frons, pronotum, and scutellum yellow to whitish, except for black to brown markings at cephalic margin of frons and black markings in each outer fourth of the pronotum and scutellum; on pronotum the black extends mesad more than in other species; dorsum of abdomen and venter black, except for a transverse band of white extending on the first four and part of the fifth abdominal segments.

Male genitalia: Styles short, broad at base, tapering rapidly to a point; processes of tenth abdominal segment very short, about one half as long as in *vittipennis*; aedeagus long and slender, curved slightly from proximal end, bending in opposite direction distally, coming to a point more as in *vanduzeei*.

Brachypterous female.

Length; to tip of forewing, 0.93 mm., of forewing, 0.52 mm., ovipositor black.

Macropterous male.

Length; to tip of forewing, 2.18 mm., to tip of abdomen, 1.4 mm., of forewing, 1.7 mm.; vertex length approximately two thirds of width; scutellum length almost three fourths its width, lateral carinae with posterior ends slightly convergent; otherwise similar to brachypterous male. Color as in brachypterous forms except for a bright orange-yellow coloration on the scutellum.

Macropterous female.

Length; to tip of forewing, 2.56 mm., to tip of abdomen, 1.74 mm., of forewing, 2.1 mm.; in other respects similar to macropterous male.

Holotype male, **allotype** female, and **paratypes**, 1 male and 3 females, Chiricahua Mts., Arizona, June 9, 1933, R. H. Beamer; other paratypes, 1 male, 3 females, Chiricahua Mts., June 9, 1933, P. W. Oman; 1 male, 1 female, Huachuca Mts., Arizona, July 8, 1932, J. D. Beamer; 1 female nymph,

Mustang Mt., Arizona, June 20, 1933, P. W. Oman. Types and paratypes in Snow Entomological Collections, University of Kansas, other paratypes in United States National Museum, and in University of Minnesota Collections.

***Laccocera vanduzeei* sp. nov.**

(Plate III, figs. 14, 14a, 15; Plate V, fig. 23)

This species is related to *vittipennis* and *minuta* but differs from these two by having the tips of the genital styles obliquely truncate and the anterior margin of the vertex roundly emarginate.

Brachypterous male.

Length; to tip of forewing, 1.0 mm., to tip of abdomen, 1.9 mm., of forewing, 0.52 mm.

Structure: Vertex nearly square, with anterior margin rounded; lateral margins of median cell almost parallel; lateral cells anteriorly truncate, tapering posteriorly, not distinctly broad in middle; a pair of pits present in each lateral cell in cephalo-mesal area; caudal cells large, with lateral carinae curved somewhat mesad; pronotum with distinct median carina, lateral carinae strongly curved; posteriorly marked by row of small pustules; head usually broader than pronotum; scutellum more than half as broad as long, lateral carinae widely separated, the distance from edge of scutellum to carinae being less than one-fourth total width of scutellum; frons considerably broader above the middle than at anterior or posterior margins, somewhat longer than broad, with each of its two compartments containing seven pits, two located anteriorly, three along lateral margin, and two posteriorly.

Color: Similar in most respects to *minuta* and *vittipennis*; vertex almost cream-colored; pronotum and scutellum cream-colored with lateral margins black to dark brown; pits light in color with dark centers; dorsum of abdomen blackish to dark brown, with transverse white band extending onto fourth tergite; venter blackish to dark brown.

Male genitalia: Ninth abdominal segment fairly large; processes of tenth abdominal segment short and narrow; genital styles divergent, not tapering to sharp point but obliquely truncate at tip; aedeagus long and slender tapering to a point, curvature of middle part less marked than in *vittipennis*.

Brachypterous female.

Length; to tip of forewing, 1.1 mm., to tip of abdomen, 1.94 mm., of forewing 0.62 mm.

Color: As in brachypterous male with exception that white band on tergum extends over a greater portion of abdomen.

Macropterous female.

Length; to tip of forewing, 2.7 mm., to tip of abdomen, 2 mm., of forewing, 2.7 mm.

Color: Somewhat lighter yellow scutellum.

Holotype male, **allotype** female, 2 males, 42 female **paratypes**, Grand Canyon, Arizona, August 11, 1927, R. H. Beamer; other paratypes 11 females, Grand Canyon, August 11, 1927, L. D. Anderson; 5 females, Grand Canyon, August 11, 1927, P. A. Read; 3 females, Oak Creek Canyon, Arizona, August 14, 1927, L. D. Anderson; 1 male, Laguna Mts., Calif., July 14, 1929, L. D. Anderson; 1 female, Laguna Mts., July 14, 1929, R. H. Beamer; 1 female, Orange County, Calif., July 14, 1929, R. H. Beamer; 12 males, 22 females, Craig, Colo., June 30, 1931, R. H. Beamer. Types and paratypes in Snow Entomological Collections, University of Kansas; other paratypes in United States National Museum and University of Minnesota Collections.

***Laccocera vittipennis* Van Duzee**

(Plate II, figs. 6, 6a, 7, 7a; Plate V, fig. 24)

1895 *Delphacinus vittipennis* Van Duzee MS. Slosson, Ent. News, 6: 5

1895 *Delphacinus vittatus* Van Duzee MS. Gillette and Baker, Hemip. Colo., p. 69

1897 *Laccocera vittipennis* Van Duzee, Bul. Buf. Soc. Nat. Sci., 5: 242 (described).

This species is the most common in the genus and the most wide spread. It is related to *minuta* and *vanduzeei* but the genital styles are longer and taper more to a point, and the aedeagus is considerably more curved. The median cell of the vertex is almost hexagonal rather than rounded anteriorly as in the above two species.

Brachypterous male.

Length; to tip of forewing, 1.12 mm., to tip of abdomen, 1.8 mm., of forewing 0.65 mm.

Structure: Greatest width of vertex considerably more than length along midline, anterior margin almost straight, caudal margin straight; median cell almost hexagonal with lateral margins parallel; lateral cells broad, widest through middle at which point their width is slightly more than width of median cell, each lateral cell containing two pits in its cephalo-mesal region; caudal cells with lateral carinae almost straight; pronotum reniform, shorter than vertex, deeply emarginate; median carina prominent, traversing length of pronotum; lateral carinae strongly curved, extending to lateral margins, with a row of 9 to 11 pits below each carina; scutellum with an indistinct median carina; lateral carinae pitted at caudal ends; frons divided into two compartments, each containing seven pits, two being anteriorly located and near the median carina, two posterior and three smaller ones along the lateral margin, of which one is near posterior margin of frons while other two are near middle; width of frons at caudal margin is same as width just above middle, narrowing to almost one third its breadth at cephalic margin.

Color: Vertex and pronotum dull white to dirty yellow; scutellum ivory to bright fulvous; lateral margins of pronotum and scutellum dark brown to blackish; upper portion pale yellow.

Male genitalia: Ninth abdominal segment large; genital styles long, their length considerably greater than anal tube processes, broad at base, converging laterally, slightly bent at acute tip; anal tube processes curved, resembling a claw; anal tube short; aedeagus strongly curved from base, ab-

luptly bending about one fourth distance from tip in opposite direction, tapering to sharp point at apex.

Brachypterous female.

Length; to tip of abdomen, 2.1 mm., to tip of forewing, 1.1 mm., of forewing, 0.60 mm.

Macropterous male.

Length; to tip of forewing, 2.62 mm., to tip of abdomen, 1.7 mm., of forewing, 2.2 mm., scutellum larger and more highly colored than in brachypterous forms.

Macropterous female.

Length; to tip of forewing, 2.76 mm., to tip of abdomen, 1.9 mm., of forewing, 2.35 mm.

Studies have been made on 115 males and 252 females from 13 states: Colorado, Idaho, Michigan, Minnesota, Montana, New Hampshire, New York, North Dakota, Oregon, South Dakota, Washington, Wyoming, and from South Saskatchewan, Canada. The majority of these are brachypterous. It has been possible to study homotypes made by P. W. Oman and a type from the Cornell University Collection has been available. Material collected from the type locality and other type material from Colorado have also been available.

Nineteen per cent of the males, 30 per cent of the females, and 26 per cent of the total number of specimens studied were macropterous, indicating a predominance of the brachypterous forms.

***Laccocera obesa* Van Duzee**

(Plate IV, figs 18, 19, 19a, 20, 20a; Plate V, fig 25)

1895 *Delphacinus obesus* Van Duzee MS, Gillette and Baker, Hemip. Colo., p. 69.

1897 *Laccocera obesa* Van Duzee, Bul. Buf. Soc. Nat. Sci., 5:244 (described).

This species is smaller but somewhat similar in coloration to *oregonensis* and *flava*. It has a **shorter** and broader aedeagus than found in any other species of the genus. The barbed apex of the aedeagus helps to differentiate *obesa* from all others in the genus. It also differs from all other species in the genus in that the lateral carinae of the median cell of the vertex extend beyond the apex to meet at the posterior margin of the frons. A modified redescription is given as follows:

Brachypterous male.

Length; to tip of forewing, 0.94 mm., of body, 1.6 mm., of forewing, 0.52 mm.

Structure: Vertex little broader than long, almost square, somewhat rounded along cephalic margin, posterior margin straight; lateral cells almost equal in size to median cell, each with two pits along mesal margin. Caudal cells almost obtuse, separated at middle by a distinct carina which divides at about middle of vertex to form caudal boundaries of median cell; margin extending around small oblong eyes is supplied with several small

pits, usually numbering seven; pronotum deeply emarginate along posterior margin with a fairly well marked median carina; lateral pronotal carinae diverge laterally and are marked below by a series of several pits, usually 10 or 11; median carina of scutellum is poorly marked; frons with six prominent pits in each compartment, two located anteriorly and two posteriorly near median carina, and a smaller pair near lateral margin above middle; seventh pit so commonly present in members of this genus has risen above posterior margin of frons; width of frons at posterior margin somewhat less than width above middle; dorsum of abdomen broad, pitted, somewhat less so than in other species.

Color: Brachypterous male exists in two distinct color forms, one quite similar in coloration to majority of macropterous and brachypterous females; this type has vertex, pronotum, and scutellum light to soiled yellow, scutellum fulvous to dark brown in lateral compartments, middle raised portion yellow; venter is light fulvous, dotted with brown; dorsum of abdomen pale yellow marked with brown in lateral regions; forewings brownish; pits banded with dull yellow, centers brown. The other type of color form has vertex, pronotum, scutellum, and frons, a bright yellow; forewings black, as is venter and tergites of abdomen; dorsum of abdomen is marked with transverse white to yellow band across second to fourth tergites, extending onto fifth and sixth; pits are black, with no light banding; legs are red to orange-yellow, lineated with brown.

Male genitalia: Styles short and stout, tapering to tip; no median carina below and between styles; processes of anal tube very short, curved at tip. aedeagus short, blunt at tip, with minute spines regularly placed along dorsal margin which is abruptly notched over one half distance to tip, somewhat like a knitting needle.

Brachypterous female.

Length; of body, 1.9 mm., to tip of forewing, 0.96 mm., of forewing, 0.52 mm.; color light as discussed under brachypterous male

Brachypterous female.

Length; of body, 2 mm., to tip of forewing, 2.2 mm.; scutellum well developed and somewhat elevated in middle.

Studies have been made on 134 males and 146 females from 11 states: Arizona, Colorado, Iowa, Kansas, Montana, Nebraska, New Mexico, South Dakota, Texas, Utah, Wyoming. These exhibit a variety of color forms. No macropterous males have been observed.

In this species 20 per cent of the females studied were macropterous and, of both sexes, slightly under 11 per cent of the specimens studied were macropterous. No macropterous males have been observed. A macropterous female from Ft. Collins, Colorado, has been compared with the type specimen by P. W. Oman, Bureau of Entomology and Plant Quarantine. Other specimens studied agree structurally with this specimen and the writer believes the identifications correct.

Laccocera zonata Van Duzee

(Plate II, figs. 8, 8a, 9, 9a; Plate V, fig. 26)

1895. *Delphacinus zonatus* Van Duzee, MS, Gillette and Baker, Hemip. Colo., p. 69.1897. *Laccocera zonata* Van Duzee, Bul. Buf. Soc. Nat. Sci., 5:243 (described).1914. *Laccocera bicornata* Crawford, Proc. U. S. Nat. Mus., 46:582

The unique structure of the aedeagus, having a secondary process just before the distal margin which suddenly expands and then tapers to a point, distinguishes this from all other species in the genus. No other species studied exhibits such an accessory structure. The processes of the tenth abdominal segment are almost twice as long as in any other species. Seven prominent pits in each compartment of the frons readily separate it from *flava* and *oregonensis*. A redescription is given as follows:

Brachypterous male.

Length: of body, 2.04 mm., to tip of forewing, 1.2 mm., of forewing, 0.5 mm.

Structure: Head large, wider than thorax, eyes overlap pronotum for over one half their length, first antennal segment one half length of second segment; vertex broader than long, and anterior margin rounded, becoming obtusely angled; caudal margin straight; all carinae distinct, lateral carinae straight and meeting anteriorly before apex of vertex, thus forming large triangular median cell; lateral cells elongated, narrow in middle and with pair of pits present in cephalo-mesal area; caudal cells large; pronotum considerably longer than in other species, slightly less than one third its width, emarginated caudally for one half its length with row of pits, usually nine, following the curved lateral carinae; median carina less distinct, lateral carinae converging but slightly, marked posteriorly on either side by a pit; frons considerably wider just above middle than at anterior or posterior margin, longer than wide; each compartment contains seven pits, two situated anteriorly, three at middle and two posteriorly; latter pair considerably removed from posterior margin of frons; dorsum of abdomen broader than generally found in other species; forewings extend to second antennal segment; pits present on abdominal segments, numbering from two to five on the sides of each segment.

Color: Pronotum, vertex, and scutellum yellow to ivory; pits lighter around periphery than in centers; forewings black, dorsum of abdomen black-

EXPLANATION OF PLATE I

Fig. 1. Head, pronotum, and scutellum to show carinae and cells

Fig. 2. Lateral view of male abdomen, showing abdominal processes, aedeagus, and genital styles

Fig. 3. Ovipositor

Fig. 4. *Laccocera flava* Crawford, brachypterous male.

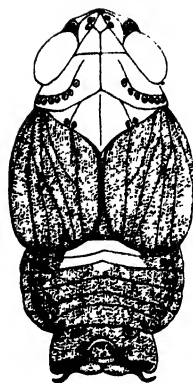
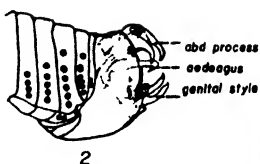
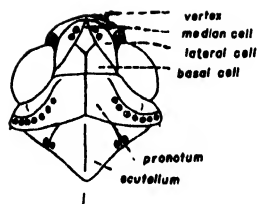
Fig. 4a. *L. flava* Crawford, frontal view of male.

Fig. 5. *L. flava* Crawford, dark colored brachypterous female

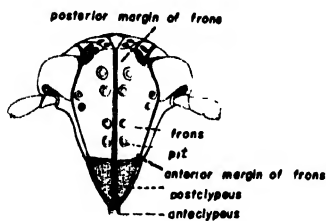
Fig. 5a. *L. flava* Crawford, frontal view of brachypterous female

Fig. 5b. *L. flava* Crawford, flavous brachypterous female.

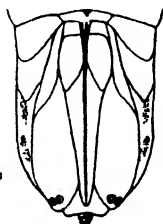
Fig. 5c. *L. flava* Crawford, flavous brachypterous female, frontal view.



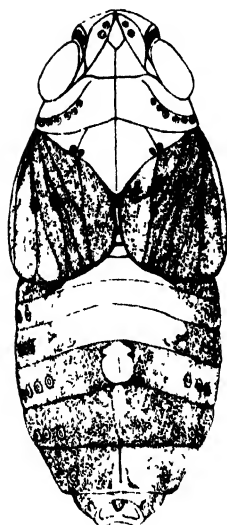
4 flava



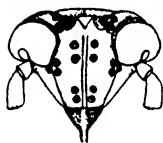
5a



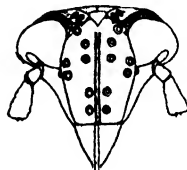
3 ovipositor



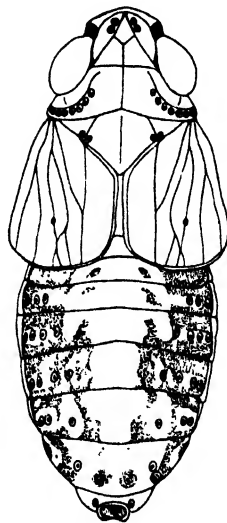
5 flava



4a



5c



5b flava

ish, marked with transverse white to yellow band which usually extends on to fourth segment; pits black; venter blackish with pits black; coxae are brown, marked with dull yellow areas; frons fulvous to dirty yellow; legs yellow, yellow-brown, or orange.

Male genitalia: Styles broad proximally, tapering broadly to pointed distal margin; processes of tenth abdominal segment very long and curved; aedeagus extends from base as a broad blade which tapers to blunt point on dorsal side, bearing on ventral margin near tip a flat process which extends laterally for short distance, then suddenly bends dorsally, gradually broadening into a flat bulbous lobe to terminate in spine-like apex.

Brachypterous female.

Length; of body, 2.28 mm., to tip of forewing, 1.26 mm., of forewing, 0.68 mm.

Color: There are two color forms of brachypterous females, both different from the male; one form considerably darker than other with vertex, pronotum, and scutellum almost fulvous; dorsum of abdomen marked with brown, with a few yellow patches near middle; pits surrounded by dull yellow bands; second form pale yellow with lateral margins of abdominal tergites marked with brown; forewings light in color; legs usually yellow in both forms, but may vary to brown.

Macropterous male.

Only one macropterous form has been observed. It is similar to brachypterous male with exception of wings. Male genitalia immediately place it in this species.

L. zonata is found only in Arizona and Colorado. Only one macropterous male has been seen but 65 brachypterous males, 23 brachypterous females and 11 female nymphs were studied. Specimens compared with the type by P. W. Oman have been available for study.

***Laccocera flava* Crawford**

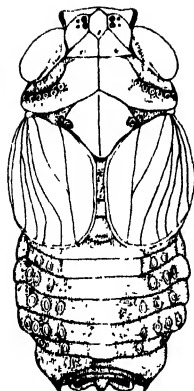
(Plate I, figs 4, 4a, 5, 5a, 5b, 5c, Plate V, fig 27)

1914 ***Laccocera zonata* var *flava* Crawford**, Proc U.S. Nat Mus, 46 581

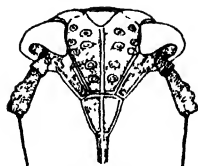
The aedeagus in this species is spatulate at the tip. This separates it from the most nearly related species, ***oregonensis***, which has a hooked tip on the aedeagus. The genital styles are more slender than in either ***oregonensis*** or ***zonata***.

EXPLANATION OF PLATE II

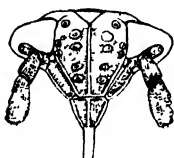
- Fig 6. ***L. vittipennis*** Van Duzee, brachypterous male
Fig 6a ***L. vittipennis*** Van Duzee, frontal view of brachypterous male
Fig. 7 ***L. vittipennis*** Van Duzee, brachypterous female
Fig 8 ***L. zonata*** Van Duzee, brachypterous male
Fig. 8a ***L. zonata*** Van Duzee, frontal view of brachypterous male
Fig 9. ***L. zonata*** Van Duzee, brachypterous female
Fig. 9a. ***L. zonata*** Van Duzee, frontal view of brachypterous female



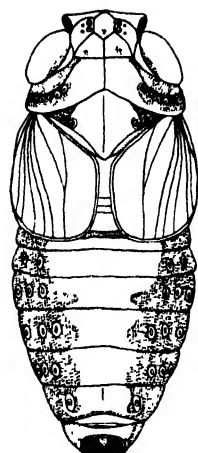
6 vittipennis ♂



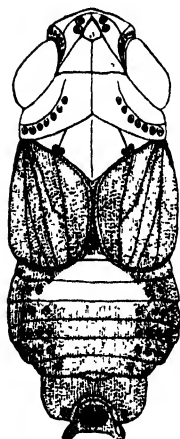
7a



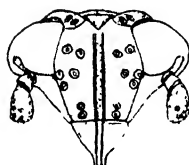
6a



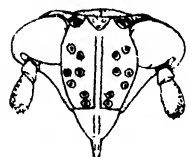
7 vittipennis ♀



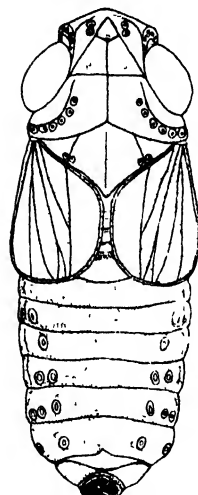
8 zonata ♂



9a



8a



9 zonata ♀

Crawford's (1914) original description is not adequate. It reads as follows: "Very similar in all characters, except color, to the species. Color almost uniform light flavous, with faint brown markings on abdomen and venter. Three females out of more than 100 specimens show this character with almost no intergradations. Very probably this is not more than a varietal form of the species—scarcely a seasonal variation, however, as all the specimens were apparently taken at the same time of the year." Because this description is inadequate, a redescription is necessary.

Brachypterous male.

Length; of body, 1.88 mm., to tip of forewing, 1.2 mm., of forewing, 0.70 mm.

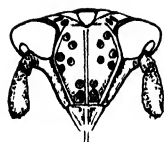
Structure: Vertex with anterior margin distinctly rounded, caudal margin emarginate, median cell angulate anteriorly due to lateral carinae being straight and meeting before apex of vertex; lateral cells about twice the length of median cell, width approximately same with two well marked pits near middle of cephalic half of each cell; caudal cells large, carinae distinct; vertex about one half width of pronotum; greatest width of vertex broader than length of vertex along mid-line; pronotum about three and one half times as wide as long; scutellum about one-half as long as wide; frons considerably longer than broad, wider just above the middle, each lateral half well marked with six distinct pits, anterior and posterior mesal pairs of which are considerably larger than lateral marginal pair; an indistinct seventh pit is present just above posterior margin of frons.

Color: Vertex, frons, pronotum, and scutellum creamy yellow; pits banded light, with dark centers; forewings and venter of abdomen black; dorsum of abdomen black except for transverse white band extending on to third and fourth tergites; legs light orange with coxal and pleural pieces brownish.

Male genitalia: Styles broad at base, gradually and sinuately curving to tip where it ends in a slight hook; processes of tenth abdominal segment short and slightly curved; aedeagus is broad proximally, then suddenly narrowed, being somewhat bent at middle, whence it tapers to spatulate tip, the latter bearing a row of small spines which extend about half the distance to first bend of aedeagus.

EXPLANATION OF PLATE III

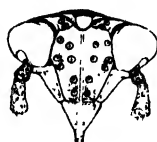
- Fig. 10. *L. minuta* sp. nov., brachypterous male
Fig. 11. *L. minuta* sp. nov., macropterous male
Fig. 11a. *L. minuta* sp. nov., frontal view of macropterous male.
Fig. 12. *L. minuta* sp. nov., brachypterous female
Fig. 13. *L. minuta* sp. nov., macropterous female.
Fig. 13a. *L. minuta* sp. nov., frontal view of macropterous female.
Fig. 14. *L. vanduzeei* sp. nov., brachypterous male
Fig. 14a. *L. vanduzeei* sp. nov., frontal view of brachypterous male.
Fig. 15. *L. vanduzeei* sp. nov., brachypterous female.



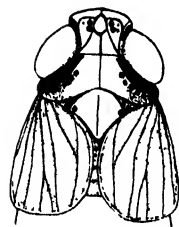
14 a



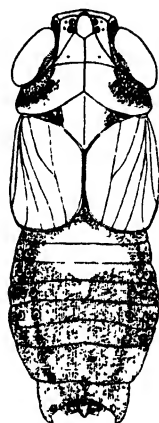
13 a



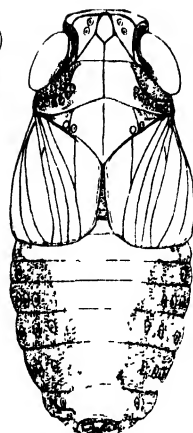
11 a



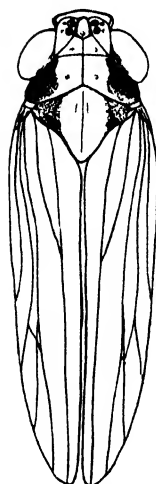
10 minuta ♂



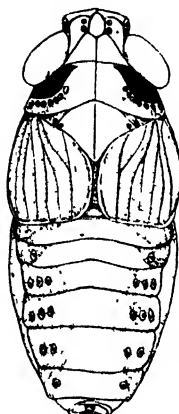
14 vanduzeei ♂



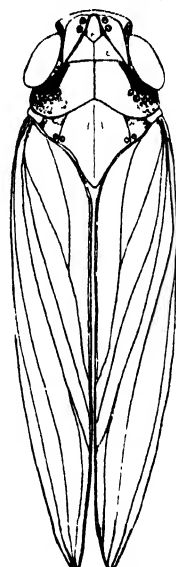
15 vanduzeei ♀



11 minuta ♂



12 minuta ♀



13. minuta ♀

Brachypterous female.

Variable. Small, dark-colored form: Length; of body, 2.38 mm., to tip of forewing, 1.14 mm., of forewing, 0.62 mm.

Large, highly colored form: Length; of body, 2.6 mm., to tip of forewing, 1.36 mm., of forewing, 0.76 mm.

Color: Several colorations. One similar to male; one fuscous for general body color with light forewings; another more highly colored, with frons, pronotum, scutellum, and vertex glazed yellow, with forewings almost brownish-red; legs vary from dull yellow to light orange often marked brown and yellow. There seems to be little constancy in nature since specimens collected at the same time exhibit variation.

Macropterous female.

Length; of body, 2.5 mm., to tip of forewing, 3.3 mm., of forewing, 2.42 mm., scutellum almost as long as broad.

Types in collection of Pomona College, California. These were not available for study.

A brachypterous female from Ormsby Co., Nevada, has been compared with the type of *zonata* var. *flava* by P. W. Oman. It agrees structurally but does not have the fulvous coloration of the type. The author is raising this variety to specific rank, basing the determination on the structural similarity with males correlated with the females studied, and the fact that they have a very distinct difference in male genital structure from the other species. No macropterous males have been seen by the author. The female is quite variable in size and coloration, the latter of which relates the species to *zonata* and *oregonensis*. Fifty-nine males and sixty-seven females have been studied from five states: California, Nevada, Oregon, Utah, and Washington. Of these, two were macropterous, and the rest brachypterous.

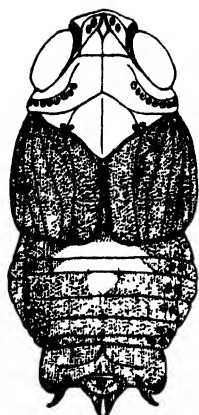
***Laccocera oregonensis* sp. nov.**

(Plate IV, figs. 16, 16a, 17, 17a; Plate V, fig. 28)

This species is similar in coloration in some respects to *zonata* and *flava* but the aedeagus differs by having a series of serrations, usually four, just before a hooked tip; styles narrower, anterior lateral carinae of median cell curved in middle. The processes of the tenth abdominal segment are about one half the length of the processes in *zonata* and similar to *flava* in this respect.

EXPLANATION OF PLATE IV

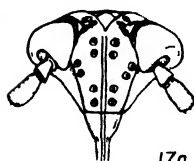
- Fig 16. *L. oregonensis* sp. nov., brachypterous male.
Fig. 16a. *L. oregonensis* sp. nov., frontal view of brachypterous male.
Fig. 17. *L. oregonensis* sp. nov., brachypterous female.
Fig. 18. *L. obesa* Van Duzee, brachypterous female.
Fig. 19. *L. obesa* Van Duzee, macropterous female.
Fig. 19a. *L. obesa* Van Duzee, frontal view of macropterous female.
Fig. 20. *L. obesa* Van Duzee, brachypterous male.
Fig. 20a. *L. obesa* Van Duzee, frontal view of brachypterous male.



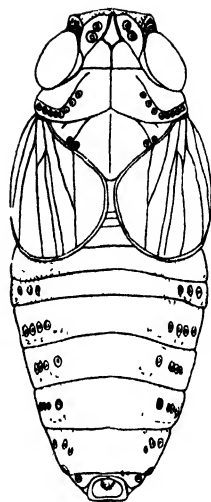
16 *oregonensis* ♀



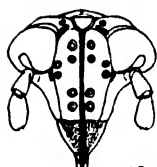
16a



17a



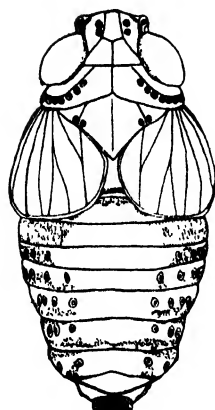
17 *oregonensis* ♀



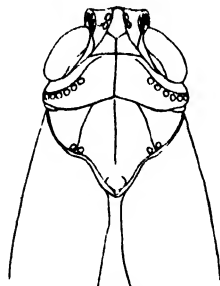
19a



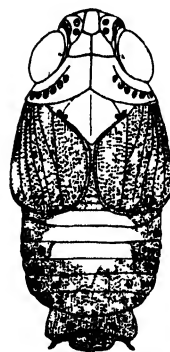
20a



18 *obesa* ♀



19 *obesa* ♀



20 *obesa* ♂

PLATE IV

Brachypterous male.

Length; of body, 1.9 mm., to tip of forewing, 1.1 mm., of forewing, 0.62 mm.

Structure: Greatest width of vertex considerably more than length along mid-line, anterior margin rounded, posterior margin straight; median cell smaller with lateral carinae narrowing anteriorly and extending forward where they meet before anterior margin of vertex; lateral cells rounded at cephalic border, containing two pits in center of each cell; caudal cells only slightly larger in comparison to lateral cells; pronotum caudally emarginate; median carina distinct; lateral carinae sharply curved, with row of pits, usually 10 in number, below them; scutellum slightly more than one half as long as wide; pitting and carinae similar to *zonata*; frons considerably longer than broad, distinctly wider above middle; six pits in each compartment, two located anteriorly, two posteriorly near median carina and two at middle of lateral margin; there is also a pit just above posterior lateral margin of frons which is not distinctly a frontal pit.

Color: Similar to *flava*; yellow, rather than ivory markings present; forewings black, dorsum of abdomen black, with transverse white to yellow band extending on to fifth abdominal segment; venter black; pits black on dorsum of abdomen and venter, light on vertex, frons, pronotum, and scutellum; legs dull orange to almost bright red, tarsi brown to yellow, legs banded fulvous.

Male genitalia: Styles broad at base, narrowing gradually to middle, then bending slightly before tapering rapidly to a point; processes of tenth abdominal segment curved, comparatively short; aedeagus broad at proximal end, narrowed through middle, typically with four serrations on ventral margin before tip, where it abruptly curves to form distinct hook.

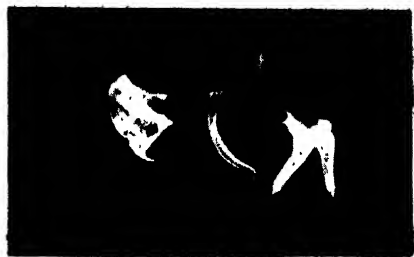
Brachypterous female.

Length; of body, 2.3 mm., to tip of forewing, 1.2 mm., of forewing, 0.7 mm., pale yellowish brown coloration.

Holotype male, **allotype** female, **paratypes**, 11 males, and 9 females, Criterion, Oregon, July 2, 1935, R. H. Beamer; other paratypes, 17 males, 24 females, Criterion Pass, Oregon, July 2, 1935, P. W. Oman. Types and paratypes in Snow Entomological Collections, University of Kansas; other paratypes in collections of the University of Minnesota, and the United States National Museum.

EXPLANATION OF PLATE V

- Fig. 22. Male genitalia of *L. minuta*, sp. nov.
Fig. 23. Male genitalia of *L. vanduzeel*, sp. nov.
Fig. 24. Male genitalia of *L. vittipennis* Van Duzee.
Fig. 25. Male genitalia of *L. obsea* Van Duzee
Fig. 26. Male genitalia of *L. zonata* Van Duzee
Fig. 27. Male genitalia of *L. flava* Crawford.
Fig. 28. Male genitalia of *L. oregonensis* sp. nov.



22. *L. minuta*



23. *L. vanduzeei*



24. *L. vittipennis*



25. *L. obesa*



26. *L. zonata*



27. *L. flava*



28. *L. oregonensis*

A NEW SPECIES OF DORYDIELLA FROM KANSAS

(Homoptera-Cicadellidae)

R.H. BEAMER

Lawrence, Kansas

Dorydiella kansana n. sp.

Resembling *Dorydiella floridana* Baker but vertex broader and last ventral segment of ♀ with lateral angles produced even with middle projection instead of even with its base and a deep median notch in this projection instead of just an indication of a notch. Length 7-8.25 mm.

Vertex usually about a quarter wider between eyes than length at middle; disc concave with a fairly definite median longitudinal sulcus; margins of vertex sharp, meeting at middle at about a right angle to slightly less.

Color: General color cinereous with brown ramose markings, costal margin of elytra lighter. Vertex with three marginal brown spots on middle third, crossing margin to face, disc with a semblance of three broad, light brown longitudinal stripes; pronotum with same semblance of stripes plus another on each side; the three middle stripes cross scutellum; elytra rather evenly covered with brown, ramose, pigment lines, denser near longitudinal axis of corium, almost solid at apex, costa light; venter fairly evenly embrowned, face with a few, narrow, light arcs, legs darker.

Genitalia: Posterior margin of last ventral segment of female excavated about one fourth length of segment with middle third projected even or almost even with lateral angles, this projection with a broad mesal notch almost its whole length. Male valve almost as wide at base as plates, angular, slightly more than a right angle; plates broadest just beyond base, narrowed to angularly blunt apices, longer than pygofer; pygofer narrowed to half basal width on outer third, ventral margin ending in a blunt, beak-like point, inner lining produced on both sides in a blunt membranous sack thickly covered with short, blunt setae; aedeagus in lateral view widest at base, much narrowed on basal fourth, widened again to outer fourth where it is sharply contracted on ventral margin to end in evenly rounded apex with two pairs of short, thick curved processes near this contraction, one pair, about as long as width of shaft at this point, curves ventrally, cephalad and out from shaft, the other pair, slightly shorter, curves dorsally, some cephalad and out from shaft.

Holotype ♂, allotype ♀, 13♂ and 14 ♀ paratypes, Meade Co., Kansas, July 24, 1944, R. H. Beamer; other paratypes 3♂s and 2♀s, same place and collector, Sept. 9, 1944.

These specimens were taken by tramping trails through rushes and reeds in the big swamp at Meade County State Park and then sweeping these trails. It evidently breeds on one or more species of swamp plant.

Types in the Snow Entomological Collections, University of Kansas, Lawrence, Kansas.

Specimens were compared with Baker's ♀ type of *Dorydiella floridana* by Doctor John S. Caldwell and it was his opinion that the Kansas specimens represent a new species.

PRICE OF BACK VOLUMES

Back Volumes \$2.00 per volume

Subscriptions for back volumes or numbers should be sent to Donald A. Wilbur, Entomology Department, Kansas State College, Manhattan, Kansas.

CONTENTS OF THIS NUMBER

Contributions to the Knowledge of the Psyllidae of Mexico.

LEONARD D. TUTHILL 1

The Genus *Laccocera* Van Duzee (Homoptera: Delphacidae).

LAWRENCE R. PENNER 30

A New Species of *Dorydiella* from Kansas (Homoptera-Cicadellidae).

* R. H. BEAMER 48

Journal of the Kansas Entomological Society

Volume 18

April, 1945

Number 2

PUBLICATION COMMITTEE

PAUL B. LAWSON, Editor, Lawrence
R. H. BEAMER, Lawrence R. H. PAINTER, Manhattan
DWIGHT ISELY, Fayetteville, Ark.



JAMES WALKER McCULLOCH
1889-1929

Entered as second-class matter June 7, 1939 at the Post Office at
Manhattan, Kansas, under the Act of August 24, 1912.

JOURNAL OF THE KANSAS ENTOMOLOGICAL SOCIETY

A quarterly journal published in January, April, July and October devoted to Entomology in the Western Mississippi Basin and the proceedings of the Kansas Entomological Society.

Manuscripts for publication may be sent to any of the publication committee.

The Kansas Entomological Society does not make exchanges since the Society does not maintain a library.

Subscription to the Journal must be paid in advance. The subscription rate is so low that second notices are not ordinarily sent out.

Payment of Canadian or other foreign subscriptions and bills must be made by international Postal Money Order or by a draft on a New York bank and payable in U.S.A. dollars.

Subscribers are urged to give us their full cooperation in these matters.

Subscriptions should be sent to Donald A. Wilbur, Entomology Department, Kansas State College, Manhattan, Kansas.

Subscriptions in the U.S.A.,	\$1.50 per year	Single Copy
Canadian or foreign subscriptions,	1.75 per year	60 cents

KANSAS ENTOMOLOGICAL SOCIETY

President, W. T. Emery, Manhattan, Kansas

Vice-president, Paul B. Lawson, Lawrence, Kansas

Secretary-Treasurer, Donald A. Wilbur, Manhattan, Kansas

Vol. 18, No. 2, April, 1945

This issue mailed April 16th.

Kansas Entomological Society

Volume 18

April, 1945

Number 2

A REVISION OF THE GENUS STRAGANIA (BYTHOSCOPIUS OF AUTHORS) IN AMERICA NORTH OF MEXICO (Homoptera, Cicadellidae)

R. H. BEAMER and PAUL B. LAWSON¹

Lawrence, Kansas.

Oman in 1936¹ assigned this group of North American leafhoppers to the genus *Bythoscopus* Germar, 1833, with *Bythoscopus lanio* (Linn.) as the type and placed *Batracomorpha* Lewis 1836, *Stragania* Stål 1862, *Gargaropsis* Fowler 1896 and *Eurinoscopus* Kirk. 1906 as synonyms.

Bythoscopus and *Batracomorpha* are both generically distinct from the species in America North of Mexico. They have the claval vein extending through the appendix, while in *Stragania* and in the forms considered in this paper, the claval vein fades out shortly after entering the appendix. The male genitalia of the latter are similar, and quite different from the type found in *Bythoscopus*. All the North American forms at present placed in *Bythoscopus* are, therefore, placed in *Stragania*.

Most of the species which are marked with red or brown are taken on the several species of the genus *Arctostaphylos*, commonly called manzanita. There are a number of species of manzanitas which are so closely related that they are very difficult to separate. We find a correspondingly difficult problem in separating a number of species of *Stragania*. This has led us to believe that either there is wide variation within a given species or else we have a number of incipient species which are not yet clearly differentiated.

In *Penestrangania* the same difficulty is apparent in the species *robusta*. Here we do not have sufficient host plant evidence to do more than to say that there seems to be great variation in size, genitalia and other characters within the species.

Stragania Stål

Stragania Stål, Rio Jan. Hemip., 2, p. 49, 1862.

The following is a translation of the original Latin description: "With the head as seen from above, very short and blunt, on anterior part convex and with the front and vertex closely joined; with antennae inserted under the fold, extending from the lower front portion of the eyes, slanting transversely to the base of the clypeus; with apex of the scutellum not sharply produced, wider than long; tegmina pelucid, sparsely set with small hairs or setae, sometimes the apex with three short longitudinal veins (Subg. Nov. *Stragania* Stål, apparently related to *Zinnecae* Am. and Serv. in size. Perhaps it should be

¹ The University of Kansas Science Bulletin, Vol. 24, p. 353, 1936.

more correctly considered a distinct genus because of the structure of the tegmina and of the scutellum.)"

The chief characteristics of the genus are as follows: the crown or vertex is short and broad, often with sides almost parallel, covered with fine transverse striae, as are the pronotum and scutellum; elytra with fine setae; claval vein extending into appendix where it disappears; male plates usually hidden beneath very long last ventral segment, leaf-like or oval in general form, mesal margins curved, apices rounded; pygofer hooks short, stout, curved to blunt apices.

Type of the genus *Stragania ornata* Stål 1862, designated by Oman 1936.

Certain species included in this revision of *Stragania*, namely *robusta apicalis* and *alabamensis*, exhibit characters in the male genitalia which we think make them worthy of subgeneric rank. We therefore propose the name *Penestrangania* for these species.

Penestrangania, new subgenus

Plates of males narrow at base, abruptly expanded and wide throughout most of their length, apical margin angularly truncated to sharp point at mesal margins which are always straight. Pygofer hooks sickle-shaped, about as long as free portion of styles.

Type of the subgenus *Pachyopsis robustus* Uhler.

Types of all new species described are in the Francis Huntington Snow Entomological Collections, University of Kansas, Lawrence, Kansas.

Key to the Species of *Stragania*

1. Females 2
Males 22
2. General color pale green without dark marks except some occasional spotting in appendix and apical cells 3
Either head, pronotum, scutellum or at least bases of elytra with some darker color 8
3. Length more than 5 mm. 4
Length 5 mm. or less 5
4. Posterior margin of last ventral segment with large rectangular notch occupying more than middle third *grandis* (Ball)
Posterior margin of last ventral segment with U-shaped median notch occupying less than median third *hyalina* n. sp.
5. Posterior margin of last ventral segment excavated 6
Posterior margin of last ventral segment truncate or produced 7
6. Posterior margin of last ventral segment deeply excavated *atra* (Bk.)
Posterior margin of last ventral segment scarcely excavated.
..... *robusta* (Uhler)
7. Last ventral segment practically truncate *apicalis* (Osborne & Ball)
Last ventral segment produced at middle *alabamensis* (Bk.)

- | | |
|---|-------------------------------|
| 8. 6 mm. in length or over | 9 |
| Less than 6 mm. in length | 13 |
| 9. Hairs on corium entirely white | <i>marginata</i> n. sp. |
| Hairs on corium not entirely white | 10 |
| 10. Last ventral segment with posterior margin produced | <i>major</i> n. sp. |
| Last ventral segment with posterior margin almost truncate | 11 |
| 11. Length 6.5 mm., hairs of elytra longer and thicker | 12 |
| Length 6 mm., hairs fewer and shorter, (Oregon) | <i>oregonensis</i> n. sp. |
| 12. Elytra with many black hairs (Upper Lake, California) | <i>longistylata</i> n. sp. |
| Elytra with few black hairs (Santa Rosa, California) | <i>acutistylata</i> n. sp. |
| 13. Last ventral segment with posterior margin slightly produced | 14 |
| Last ventral segment with posterior margin truncate or excavated | 15 |
| 14. Length 5.5 mm., only a very slight median notch | <i>magna</i> (Bk.) |
| Length 5 mm.; median notch U-shaped, almost as deep as broad | <i>gibbosa</i> n. sub. sp. |
| 15. Greenish species, without red or pink coloring except for brown stripes bordering scutellum | 16 |
| Dorsum with at least some red or pink | 17 |
| 16. Posterior margin of female last ventral segment concave, with median tooth | <i>franciscana</i> (Baker) |
| Posterior margin of female last ventral segment almost truncate | <i>bisignata</i> (Ball) |
| 17. Median notch of female last ventral segment at least as long as distance from lateral edge of notch to lateral margin of segment | 18 |
| Median notch of female last ventral segment shorter than distance from lateral edge of notch to lateral margin of segment | 21 |
| 18. Median notch of female last ventral segment very broad, almost reaching lateral margin of segment with a large rounded median tooth | <i>rufoscutellata</i> (Baker) |
| Median notch of female last ventral segment not almost reaching lateral margin of segment | 19 |
| 19. Scutellum light | 20 |
| Scutellum with at least some dark at base | <i>turgida</i> n. sp. |
| 20. Margins of vertex almost parallel | <i>alboscuteclata</i> n. sp. |
| Vertex much longer at middle than next eyes | <i>californica</i> (Baker) |
| 21. Elytra usually greenish, heavily pruinose | <i>pruinosa</i> n. sp. |
| Elytra usually pink, not heavily pruinose | <i>rubra</i> n. sp. |
| 22. Dorsum without dark marks except small spots in appendix and apical cells | 23 |
| Dorsum with some dark color other than in appendix and apical cells | 25 |
| 23. Apex of style bent into semicircle | <i>apicalis</i> (Osb. & Ball) |
| Apex of style not so strongly curved | 24 |

24. Head much narrower than pronotum, setae on surface of elytra mostly white, separated by more than their own length; styles of male slightly curved out at tip **alabamensis** (Bak.)
 Head but little narrower than pronotum; setae black, nearer than their own length on surface of elytra **robusta** (Uhler)
25. Aedeagus sharply constricted at or just beyond middle 26
 Aedeagus not sharply constricted at or just beyond middle. 33
26. Style in lateral view with sides almost parallel from near base to tapering apex 27
 Style sharply contracting near basal third 29
27. Style beyond swelling at attachment sharply converging on outer third, larger, more robust (6 mm.) **marginata** n. sp.
 Style beyond swelling at attachment sharply converging on outer half; smaller, more slender (5.75 mm.) 28
28. More than 5 mm. long, slender, vertex almost twice as long at middle as next eyes **acutistylata** n. sp.
 About 5 mm. long, distinctly more robust, vertex almost parallel-sided **gibbosa** n. sub. sp.
29. Apex of style distinctly curved in **rubra** n. sp.
 Apex of style straight or curved slightly out 30
30. Style very long, almost three times as long as aedeagus **longistylata** n. sp.
 Style shorter, never more than two and one third times as long as aedeagus 31
31. Head and thorax usually black; style usually widest near beginning of outer third **oregonensis** n. sp.
 Head and thorax usually not black 32
32. Large species, more than 5 mm. in length; both males and females usually reddish on dorsum **major** n. sp.
 Smaller, not more than 5 mm. in length; both sexes heavily pruinose. **pruinosa** n. sp.
33. Yellowish green with some darker markings 34
 Brown or reddish species, vertex and prothorax often black 39
34. Head distinctly narrower than pronotum; species slender 35
 Head almost as wide as pronotum 36
35. Length 4 mm. **bisignata** (Ball)
 Length 5 mm. **hyalina** n. sp.
36. Vertex, pronotum and scutellum usually black 37
 Vertex, pronotum and scutellum not usually black 38
37. Length 5 mm. or more, elytra usually with distinct black marks **grandis**, Ball)
 Length 4.5 mm.; elytra usually without black marks **atra** (Bk.)
38. Scutellum brown, edge of elytra along scutellum narrowly embrowned. **rufoscutellata** (Bk.)

- Scutellum stramineous, elytra along scutellum usually broadly em-browned **franciscana** (Bk.)
39. Apical half of scutellum light, contrasting sharply with darker sur-roundings 40
- Apical portion of scutellum mostly dark 41
40. Style contracted near base, widest on apical third in lateral view **alboscuteolata** n. sp.
- Style not contracted near base, gradually tapering to sharp apex on outer third **californica** (Bk.)
41. Style not contracted near base; aedeagus very broad in lateral view **magna** (Bk.)
- Style contracted near base in lateral view **turgida** n. sp.

1. *Stragania* (*Penestrangania*) **robusta** (Uhler)

Pachyopsis robustus Uhler, P. R., Bull. U. S. G. S., 3, p. 467, 1877

Resembling *S. ornatula* Stål but entirely green in color. Length male 3.75-4.5, female 4-5 mm.

Vertex short, broadly rounded, sides almost parallel; elytra sparsely set throughout with short, black setae.

Color: Pea green when collected, fading to stramineous with age. elytra often semihyaline.

Genitalia: Posterior margin of female last ventral segment slightly bisinuate, usually with small median protuberance. Pygofer of male narrow with a large sickle-shaped hook with prominently angled hump just before middle on outside of curve, tapered on outer fourth to sharp point; plates with mesal margin straight, bases rounded, widening on outer margin to apical fifth, then angularly truncated to sharp mesal point; styles small, scarcely larger than pygofer hooks, widest near middle in lateral view, gradually narrowing and curving dorsally to sharp apex.

Allotype, male, Star County, Texas, July 30, 1928, L. D. Beamer.

Many specimens at hand from Florida to California show considerable variation in size, shape of vertex, color and size of setae, and some variation in genitalia, but no stable characters have been found upon which to separate them if they are more than variations.

2. *Stragania* (*Penestrangania*) **alabamensis** (Baker)

Macropsis alabamensis Baker, C. F., Psyche, p. 58, 1900

Resembling *S. robusta* (Uhler) but setae on outer surface of elytra light instead of dark. Length 4-4.5 mm.

Head distinctly narrower than pronotum; vertex with margins usually almost parallel. Elytra almost hyaline, sparsely set with short light-colored setae.

Color: Greenish to stramineous with the mesal margin often darker green or fuscous usually with small fuscous spot at apex of clavus and the outer ends of apical cells.

Genitalia: Posterior margin of female last ventral segment produced on median two thirds, sometimes with a very small notch at apex. Pygofer of male with a large, sharp pointed, sickle-shaped hook; aedeagus enlarged on apical third in lateral view; style in ventral view thickest near middle, gradually tapering to sharp point which is slightly curved out near apex; plate as in *S. robusta*, hidden, inner margin straight.

Allotype male, Clarksville, Tenn. 4 paratypes, same data. Specimens are at hand from Nebraska, Kansas, Tennessee and Alabama.

3. *Stragania (Penestrangia) apicalis* (Osborn and Ball)

Macropsis apicalis Osborn, H. and Ball, E D, Proc Dav Acad Sci, p 64, 1898

Resembling *S. alabamensis* (Baker) but head much wider in relation to pronotum, setae many times more numerous on elytra, posterior margin of last ventral segment of female almost straight across and outer third of style of male bent into almost a half circle. Length 4.5-5 mm.

Head broad in relation to pronotum, margins almost parallel. Elytra closely set with fine white setae.

Color: Pale green in life, changing to stramineous in museum specimens, with small fuscous dashes in and about the appendix and apices of apical cells.

Genitalia: Posterior margin of last ventral segment of female almost truncate. Pygofer of male with large hook, slightly curved, thickened near middle, contracted on outer third to narrow, sharp point; plate, like that in *S. robusta*, hidden, mesal margin straight, apex sharp; style in ventral view widest near middle, narrowed and curved into almost a half circle on outer third.

Cotypes from honey locust in collection at Ames, Iowa. Common on honey locust in central states.

4. *Stragania marginata* n. sp.

Resembling *S. ornatula* Stål in that there is more or less red or black on dorsum but more closely related to *S. acutistylata* from which it may be distinguished by mostly white setae on corium of females and shorter male styles, with apex converging on its outer one third. Length 6 mm.

Vertex broadly rounded, distinctly longer at middle than next eyes. Elytra of male with setae about their own length apart, black in color, except on anterior half of clavi white; setae of female shorter, more closely set and white throughout.

Color: On dorsum male dark red; vertex, pronotum and scutellum often brownish to black; front usually darkest, extreme apex of scutellum lighter; appendix, narrow band at apex of elytra and more or less of venter fuscous. Female elytra light, (pale green occasionally pink) except narrow, pink or red border on elytra opposite scutellum and fuscous appendix; vertex, pronotum, scutellum, except tip, fuscous; margins of pronotum and scutellum, except tip, darker; front brownish, occasionally darker, remainder of venter light.

Genitalia: Posterior margin of last ventral segment of female slightly produced with a U-shaped median notch. Male style in dorsal view about twice as long as aedeagus, sides almost parallel to outer fourth, then converging to sharp apices; aedeagus in lateral view sharply narrowed on outer half, about half as wide as basal half.

Holotype male, allotype female, 14 male and 29 female paratypes, Warner Springs, Calif., July 28, 1938, R. H. Beamer. Taken mostly from *Arctostaphylos glandulosa* East and *glauca* Lind.

5. *Stragania acutistylata* n. sp.

Resembling *S. marginata* but female with some black setae, pronotum pink and scutellum light; male style shorter, sharply converging on outer half. Length male 5.75, female 6-6.25 mm.

Vertex broadly rounded, almost twice as long at middle as next eyes; elytra thickly covered with long, white setae, interspersed with black ones.

Color: Male usually red, although sometimes pale, with front usually black; vertex, pronotum, most of scutellum, mesal basal portion of clavi and narrow border at apices of elytra, including appendix, brown; female vertex, pronotum and scutellum ivory, posterior two thirds of pronotum often pink to reddish, tiny basal angles of scutellum brown; elytra light greenish, more or less pruinose with basal mesal half of clavi heavily embrowned, often entire mesal margin of clavi more or less pink and sometimes entire elytra pink; venter stramineous with front somewhat darker and legs often more or less tinged with green.

Genitalia: Posterior margin of last ventral segment of female slightly concave with a median, more or less rectangular notch, about twice as broad as deep. Male style in lateral view about twice as long as aedeagus, sides not contracted on basal half but converging on at least outer third to sharp point; aedeagus in lateral view very slightly narrowed on outer half, just barely distinctly narrower than basal half.

Holotype male, allotype female, 55 male and 34 female paratypes, Santa Rosa, Calif., August 16, 1938, R. H. Beamer and R. I. Sailer. These were mostly swept from *Arctostaphylos manzanita* Parry. Numerous other specimens which seem to be this species, from many localities in California, are at hand, swept from several other species of *manzanita*.

5a. *Stragania acutistylata gibbosa* n. sub. sp.

Resembles *S. acutistylata* in male genitalia but shorter and distinctly more robust, with the last ventral segment of female with posterior margin slightly produced with median rounded notch almost as deep as wide. Length 5 mm. Vertex only slightly longer at middle than next eyes. Length distinctly shorter in proportion to width, giving it a robust appearance.

Holotype male, allotype female, 7 male and 3 female paratypes, Lompoc, California, August 9, 1939, R. H. Beamer. Swept from *Arctostaphylos pechenensis viridissima* East.

6. *Stragania rubra* n. sp.

Resembling *S. oregonensis* but smaller and apex of style curving in in dorsal view. Length male 4.75, female 5 mm.

Vertex short, broadly rounding, slightly longer at middle than next eyes; elytra covered with fairly long, rather sparse, setae.

Color: Male usually red with front dark; vertex, pronotum and scutellum, except tip, brown, sometimes black; clavi about scutellum and narrow border at apices of elytra, including appendix, brown; venter often more or less brown; some setae on elytra white, others black. Female often red, sometimes lighter, underside pink; clavi bordering scutellum and appendix brown, setae on elytra mostly white, interspersed with some black ones.

Genitalia: Posterior margin of last ventral segment of female almost truncate with a shallow median excavation about half as wide as lobe either side. Male styles a little more than twice as long as aedeagus, in lateral view contracted about middle to two thirds width beyond, apices sharp, incurved; aedeagus with sides converging almost evenly from base to apex.

Holotype male, allotype female, 3 male and 1 female paratypes, Monterey, California, August 10, 1938, R. I. Sailer. One female paratype same place and date, R. H. Beamer.

7. *Stragania longistylata* n. sp.

Resembling *S. major* but more slender; style of male very long, about three times length of aedeagus. Length male 5.75, female 6.25 mm.

Vertex broadly rounded in female, more angular in male, almost twice as long at middle as next eyes. Elytra fairly thickly set with rather stout setae, part of them black and others white.

Color: Male red, with brown vertex, pronotum and scutellum, except tip occasionally lighter brown; venter usually stramineous with front brown to black. Female usually ivory to greenish, with vertex, pronotum and scutellum often more or less brownish or reddish; apex of scutellum lighter and mesal half of clavi brown to reddish. In some specimens the entire elytra are pink.

Genitalia: Posterior margin of last ventral segment of female almost truncate with a median U-shaped excavation about as deep as wide. Male style long, at least two and one half times as long as aedeagus; in ventral view, slightly contracted near middle and narrowed on outer third to sharp apex; aedeagus in lateral view rather slender, slightly but distinctly narrowed on outer half.

Holotype male, allotype female, 9 male and 9 female paratypes, Upper Lake, California, July 16, 1935, R. H. Beamer.

8. *Stragania oregonensis* n. sp.

Resembling *S. pruinosa* but larger; head, pronotum and scutellum of males usually black and most of setae on elytra of both sexes dark. Length male 5.5, female 6 mm.

Vertex very short, sides almost parallel; length at middle slightly longer for a short distance than next eyes. Elytra sparsely set with short, stout setae, mostly black in color except on basal half of clavi.

Color: Male brownish-red on elytra, black to brown on front, vertex, pronotum and scutellum, except apex of scutellum and small spot about ocelli which is ivory; venter more or less dark. Female ivory to semihyaline on elytra except portion of elytra bordering scutellum darker; front brownish to black; pronotum light brown, scutellum with three black spots on base, remainder light brown with apex ivory; venter stramineous, with abdomen tinged with green.

Genitalia: Posterior margin of last ventral segment of female truncate with a median shallow notch slightly wider than half distance from edge of notch to margin. Male style less than twice as long as aedeagus, unusually small for such a large species; in lateral view, strongly contracted on middle third, inner margin converging to form a sharp apex; aedeagus large, contracted on outer half to about two thirds basal width.

Holotype male, allotype female and 4 male paratypes, Hecita, Oregon, July 11, 1935, R. H. Beamer.

9. *Stragania major* n. sp.

Resembling *S. marginata* but larger and broader. Male style slightly contracted near middle and female with dark setae on elytra. Length male 6, female 6.25 mm.

Vertex broadly rounded, about one third longer at middle than next eyes. Elytra thickly set with long setae, about evenly distributed black and white except all white on basal half of clavi.

Color: Male red; front black; vertex, pronotum and scutellum, except apex, brown; appendix, except almost black spot at end of claval vein, brown. Venter mottled with brown. Female brownish-pink front and vertex, anterior part of pronotum and spots on scutellum ivory, venter stramineous, more or less marked with fuscous, especially on last ventral segments and pygofer.

Genitalia: Posterior margin of last ventral segment of female very slightly produced, with a U-shaped notch at middle. Male style slightly more than twice as long as aedeagus, contracted near middle in lateral view, tapering on outer third to sharp point; aedeagus large, in lateral view sharply narrowed on slightly more than outer third to less than half of basal width.

Holotype male, 5 male and 1 female paratypes, San Jacinto Mts., California, July 31, 1936, R. H. Beamer. Allotype female and 1 male and 1 female paratypes, same place and date, D. R. Lindsay. Other paratypes 3 males, same locality, July 30, 1938, R. H. Beamer; 1 male and 1 female, same locality, July 21, 1929, L. D. Anderson and R. H. Beamer. This is the largest species yet found on the manzanitas.

10. *Stragania pruinosa* n. sp.

Resembling *S. major* but definitely smaller, not more than 5 mm. in length, heavily pruinose. Length 4.25-5 mm.

Vertex broadly rounded, usually distinctly longer at middle than next eyes. Elytra thickly covered with setae, part of them black and part white; those on male somewhat coarser and more sparsely set than on female.

Color: Male red except vertex, pronotum, most of scutellum and clavi bordering scutellum, brown; appendix and apex of elytra, fumose; venter with front mostly black, brown around margin, last ventral segment red; remainder stramineous, more or less tinged with green. Female with front and vertex ivory; pronotum with front margin ivory, remainder pink; scutellum ivory; slightly more than inner half of clavi red; appendix and small apical border of elytra fumose, remainder of elytra slightly bluish-green; venter stramineous, more or less tinged with green.

Genitalia: Posterior margin of last ventral segment of female almost truncate with a flat bottomed notch about half as long as distance from edge of notch to margin of segment. Male style slightly more than twice as long as aedeagus, in lateral view strongly contracted near middle, much boarder till near apex, ventral margin converging to sharp point; aedeagus in lateral view sharply constricted on slightly more than outer half, about two thirds as wide as basal portion.

Holotype male, allotype female, 37 male and 30 female paratypes, Boulevard, California, July 28, 1938, R. H. Beamer. Numerous other specimens are at hand from Pine Valley, Quatay, Anza, and Idyllwild, Calif. This species was swept from *Arctostaphylos pungens* H. B. K.

11. *Stragania hisignata* (Ball)

Macropsis hisignatus Ball, E. D., Can. Ent., 34, p. 303, 1902

Resembling *S. apicalis* (Osborn and Ball) externally but with dark markings on dorsum in both sexes. Length male 4-4.5 mm., female 4.5-5.5 mm.

Head distinctly narrower than pronotum especially in male; vertex broadly rounded in female, angular in male, distinctly longer at middle than next eyes. Elytra sparsely set with short setae, black, except white on basal portion of clavi.

Color: Greenish-yellow to semihyaline, with basal angles of scutellum, broad band bordering scutellum and reaching half length of clavi, appendix and apical cells, brown; venter stramineous, legs tinged with green.

Genitalia: Posterior margin of last ventral segment of female almost truncate with slightly produced lobe on either side of shallow median excavation. Male style scarcely twice as long as aedeagus in lateral view, broad at point of attachment, then sharply narrowed and nearly parallel-margined almost to acute apex; aedeagus in lateral view almost parallel-margined, slightly broadened just before upturned apex.

Types from Colorado in E. D. Ball Collection, United States National Museum, Washington, D.C. Specimens at hand from Colorado, Utah, Arizona

and New Mexico. A male and a female in the Ball Collection, United States National Museum, labeled Palmer Lake, Colo., 9-18-01, are here designated as lectoholotype and lectoallotype.

12. *Stragania rufoscutellata* (Baker)

Macropsis rufoscutellatus Baker, C. F. Psyche, 9, p. 58, 1900

Superficially resembling *S. robusta* (Uhler) but with some dark marking on dorsum in both sexes. Length 4.5-5 mm.

Vertex very short, in female broadly rounded, scarcely longer at middle than next eyes; in male more angular and definitely slightly longer at middle than next eyes. Elytra fairly evenly set with setae about their own length apart, setae dark in color except on basal half of clavi, light.

Color: Usually bluish-green to semihyaline, except scutellum and adjoining clavi, brownish; in some specimens, vertex, anterior portion of pronotum and scutellum ivory.

Genitalia: Posterior margin of last ventral segment of female excavated from side to side with bottom of this excavation broadly but slightly produced. Male style about two and one fourth times as long as aedeagus, greatly widened at its connection with plate, almost parallel-sided to sharply pointed outer third, coarsely serrate on apical fourth of ventral margin except extreme tip, aedeagus slightly enlarged at tip, ventral margin rounded off to meet almost straight dorsal margin at tip.

Baker types in U. S. National Museum. The above description from a homotype female from Palmer Lake, Colo. and a male from Nederland, Colo. Numerous specimens are at hand from Colorado, Wyoming, New Mexico, Utah and Arizona.

13. *Stragania franciscana* (Baker)

Macropsis franciscana Baker, C. F. Invert. Pac., 1, p. 12, 1903

Resembling *S. rufoscutellata* (Baker) but scutellum usually ivory instead of brown and excavation in last ventral segment of female with a short, sharp tooth. Length male 4.5, female 4.75 mm.

Vertex short, broadly rounding, barely longer at middle than next eyes. Elytra with moderately long setae about their own length from each other, dark in color except on basal half of clavi.

Color: Ivory on vertex, pronotum and scutellum, more or less tinged with green, except on scutellum; elytra bluish-green to semihyaline, broadly embrowned on inner basal halves of clavi, usually a brown spot in base of appendix; venter stramineous, legs tinged with green.

Genitalia: Posterior margin of last ventral segment of female concave with a short, sharp, median tooth. Male style less than two and one half times as long as aedeagus, broad near attachment to plate, tapering at first rapidly for a short distance, then gradually to sharp out-curved apex; aedeagus gently tapered from base to apex.

Numerous specimens at hand from a great many localities in California.

14. *Stragania hyalina* n. sp.

Resembling *S. bisignata* (Ball) but larger, female without dark color on basal half of clavi and last ventral segment truncate instead of produced as in *bisignata*. Length male 5, female 5.75 mm.

Vertex short, broadly rounded, scarcely longer at middle than next eyes. Elytra rather sparsely set with short setae, black except on basal half of clavi where they are light.

Color: Vertex, pronotum and scutellum ivory, often tinged with green; elytra semihyaline except basal half of clavi, opaque white. In male appendix, apical cells and most of opaque area in clavi brown; in female only appendix and apical cells brown; venter stramineous, more or less tinged with green.

Genitalia: Posterior margin of last ventral segment of female truncate or slightly produced on either side of a V-shaped notch with a rounded base. Male style about twice as long as aedeagus, contracted for some distance near middle, ending in sharp point; aedeagus in lateral view slightly contracted just before enlarged blunt tip.

Holotype male, allotype female, 4 male and 8 female paratypes, San Antonio Canyon, Calif., August 4, 1938, R. I. Sailer.

15. *Stragania atra* (Baker)

Macropsis atra Baker, C. F., Psyche, 9, p. 56, 1900

Resembling *S. ornatula* Stål but head almost as wide as pronotum, style of male sharp-pointed at apex instead of boot-shaped. Length male 4, female 4.25 mm.

Head almost as wide as pronotum; vertex short, broadly rounded, slightly longer at middle than next eyes; elytra sparsely set with setae, more than their length apart, black in color except light on basal half of clavi.

Color: Male head, pronotum and scutellum, except apex, black; elytra whitish opaque on basal inner half of clavi, embrowned on mesal margin; remainder semihyaline with appendix and apical cells infuscated; front dark brown to black, remainder of venter more or less infuscated. Female yellowish-green, scutellum ivory, elytra semihyaline; venter stramineous, tinged with green.

PLATE I

1. Lateral view of aedeagus and style of *Stragania* (*Penestragania*) *robusta* (Uhler)
- 1a. Plate, pygofer and pygofer hook of *Stragania* (*Penestragania*) *robusta* (Uhler)
2. Lateral view of aedeagus and style of *Stragania* (*Penestragania*) *alabamensis* (Baker).
- 2a. Plate, pygofer and pygofer hook of *Stragania* (*Penestragania*) *alabamensis* (Baker).
3. Lateral view of aedeagus and styles of *Stragania* (*Penestragania*) *apicalis* (Osb. and Ball).
- 3a. Plate, pygofer and pygofer hook of *Stragania* (*Penestragania*) *apicalis* (Osb. and Ball).
4. Lateral view of aedeagus and style of *Stragania marginata* n. sp.
5. Lateral view of aedeagus and style of *Stragania acutistylata* n. sp.
6. Lateral view of aedeagus and style of *Stragania rubra* n. sp.
7. Lateral view of aedeagus and style of *Stragania longistylata* n. sp.
- 8 and 8a. Lateral view of aedeagus and style of *Stragania oregonensis* n. sp.



1. *S. robusta*

1a

2. *S. alabamensis*



2a

3. *S. apicalis*

3a



4. *S. marginata*

5. *S. acutistylata*

6. *S. rubra*



7. *S. longistylata*

8. *S. oregonensis*

9a

Genitalia: Posterior margin of last ventral segment of female deeply excavated from side to side, with broad, angular tooth at middle of excavation. Male style in lateral view slightly more than twice as long as aedeagus, tapered from widened area near connection with plate to sharp apex; aedeagus in lateral view with shaft straight beyond middle bend, sides tapering to blunt apex.

Specimens have been studied from Utah and Wyoming.

16. *Stragania grandis* (Ball)

Macropsis grandis Ball, E D, Can Ent., p. 186, 1909.

Externally resembling *S. hyalina* but male with much more dark on dorsum and female with rectangular notch in posterior margin of last ventral segment one third as wide as segment. Length male 4.75, female 5.75 mm.

Vertex varies in shape from almost parallel-margined to much longer at middle than next eyes. Elytra of male sparsely set with very short, mostly light setae; female elytra more closely set with short setae, light ones on basal half of clavi and corium, others dark.

Colors: Male varies from broad black stripe down dorsum, bordered with light, to almost entirely without black. Female stramineous, more or less tinged with green.

Genitalia: Posterior margin of last ventral segment of female truncate, with rectangular notch, occupying more than middle third, about one third as deep as broad. Male style in lateral view slightly more than twice as long as aedeagus, enlarged at connection with plate, ventral margin converging on about outer third to sharp apex, coarsely rastrate on apical half of ventral margin except extreme tip; aedeagus in lateral view with sides almost parallel, ventral margin curving dorsally on outer third to form a rounded tip. Pygofer hook avicephaliform.

Specimens are at hand from Colorado, Arizona, Utah and Wyoming.

17. *Stragania alboscuteolata* n. sp.

Resembling *S. californica* (Baker) but outer half of male style widest on outer third. Length 4.75-5.5 mm.

PLATE II

9. Lateral view of aedeagus and style of *Stragania major* n. sp.
10. Lateral view of aedeagus and style of *Stragania pruinosa* n. sp.
11. Lateral view of aedeagus and style of *Stragania bisignata* (Ball)
12. Lateral view of aedeagus and style of *Stragania rufoscuteolata* n. sp.
13. Lateral view of aedeagus and style of *Stragania franciscana* (Baker)
14. Lateral view of aedeagus and style of *Stragania hyalina* n. sp.
15. Lateral view of aedeagus and style of *Stragania atra* (Baker).
16. Lateral view of aedeagus and style of *Stragania grandis* (Ball)
17. Lateral view of aedeagus and style of *Stragania alboscuteolata* n. sp.
18. Lateral view of aedeagus and style of *Stragania californica* (Baker).
19. Lateral view of aedeagus and style of *Stragania magna* (Baker).
20. Lateral view of aedeagus and style of *Stragania turgida* n. sp.



9 *S. major*

10 *pruinosa*

11. *S. bisignata*



12 *S. rufoscutellata*

13 *S. franciscana*

14. *S. hyalina*



15. *S. atra*

16 *S. grandis*

17. *S. alboscuteolata*



18. *S. californica*

19. *S. magna*

20. *S. turgida*

Vertex short, broadly rounded, slightly longer at middle than next eyes; elytra fairly closely set with rather short setae, about half of them black and half white.

Color: Male red, vertex, pronotum and base of scutellum brown to black, apical half or more of scutellum usually ivory, most of front often brown to black, remainder of venter stramineous; female vertex and pronotum ivory, tinged with red, scutellum lighter; elytra with band of pink or red on basal half of clavi up to first claval vein, remainder greenish-yellow semihyaline; venter stramineous, tinged with green.

Genitalia: Posterior margin of last ventral segment of female with a shallow rectangular median excavation occupying more than one third entire width. Male style long, widened at attachment to plate, contracted at middle, gradually enlarging to just before sharp apex; aedeagus in lateral view broad throughout, ventral margin curved dorsally on outer third.

Holotype male, allotype female, 9 male and 3 female paratypes, Sequoia National Park, California, August 6, 1940, R. H. Beamer. 6 male and 4 female paratypes, Yosemite National Park, California, August 1, 1940, R. H. Beamer.

18. *Stragania californica* (Baker)

Macropsis californicus Baker, C. F., Psyche, 9, p. 57, 1900

Resembling *S. alboscuteolata* but style in lateral view not contracted near middle, aedeagus more slender, with tip curved dorsally on outer fourth. Female last ventral segment "deeply emarginate" at middle on posterior margin. Length male 4.75, female 5 mm.

Vertex narrow, sides almost parallel; elytra fairly thickly set with long setae, about half of them dark and half light.

Color: Male vertex black, except hind margin ivory; pronotum black on anterior half, remainder brown; scutellum ivory, basal margin black; elytra reddish, darker near scutellum. Female "head, all below and elytra largely, pale straw color. Pronotum rufescent. A narrow area on clavus, adjoining inner angle, usually deep reddish. Elytra often more or less with reddish toward base."

Genitalia: Posterior margin of last ventral segment of female slightly excavated or truncate with shallow rectangular notch about as wide as lobe on either side; male style not much wider at point of attachment than beyond, gradually tapering to sharp apex; aedeagus in lateral view unusually long from right angle bend to apex, sides almost parallel, outer fourth bent slightly dorsally, ventral margin rounding to dorsal.

Types in United States National Museum.

19. *Stragania magna* (Baker)

Macropsis magnus Baker, C. F., Psyche, 9, p. 57, 1900.

Resembling *S. californica* (Baker) but last ventral segment of female with

PLATE III

The female last ventral segment of the various species of *Stragania*.



1. *S. robusta*

2. *S. atabamensis*



3. *S. opicalis*

4. *S. marginata*

5. *S. acutistylata*



6. *S. rubra*

7. *S. longistylata*

8. *S. oregonensis*



9. *S. major*

10. *S. pruinosa*

11. *S. bisignata*



12. *S. rufoscutellata*

13. *S. franciscana*

14. *S. hyalina*



15. *S. atra*

16. *S. grandis*

17. *S. alboscutellata*



18. *S. californica*

19. *S. magna*

20. *S. lugida*

three rounded shallow excavations, style of male not contracted near middle and aedeagus very broad in lateral view, wider at middle than at angular bend. Length male 5, female 5.5 mm.

Vertex short, broadly rounded, margins almost parallel; elytra rather sparsely set with setae, dark in color, except on basal inner halves of clavi which are light and longer and more thickly set.

Color: Male vertex, except ivory spot about ocelli, pronotum and scutellum, except ivory apex, black; slightly more than inner half of clavi red; remainder of elytra semihyaline tinged with brown; front black, remainder of venter stramineous, more or less tinged with brown. Female vertex light brown, darker next eyes; pronotum light brown, tinged with red on posterior half; scutellum dark brown on basal half, remainder ivory; slightly more than inner half of clavi red; appendix brown; remainder of elytra stramineous to semihyaline, tinged with green in fresh specimens.

Genitalia: Posterior margin of last ventral segment of female produced on inner half, with a shallow, rounded excavation at middle. Male style more than twice as wide at point of attachment as beyond, not contracted at middle in lateral view, sides converging on outer third to sharp point; aedeagus in lateral view almost one third as wide as long, widest beyond angular bend, slightly curved dorsally, ventral margin curved to meet dorsal in rounded tip.

Type female in United States National Museum, Washington, D. C.

Specimens at hand from Tia Juana, and Stinson Beach, California, the latter collected from *Ceanothus thyrsiflorus* Esch.

20. *Stragania turgida* n. sp.

Resembling *S. magna* (Baker) but female last ventral segment deeply excavated from side to side and male style contracted near middle. Length female 5.25 mm., male slightly smaller.

Vertex short, broadly rounded, in male almost parallel-margined, in female longer on middle than next eyes; elytra thickly set with short setae, on clavi white, on corium, more white than black.

Color: Male vertex, pronotum and scutellum except ivory apex, black; elytra red, appendix and apical cells fumose; female vertex, pronotum and scutellum except ivory apical two thirds, light brown; clavi with more than mesal half red, remainder greenish, corium greenish; front light brown, remainder stramineous, tinged with green.

Genitalia: Posterior margin of last ventral segment of female slightly concave with broad but shallow excavation over more than middle third. Male style about twice as wide at attachment as any other place, sharply contracted near middle, sharpened on outer third; aedeagus with shaft long, in lateral view, contracted on about outer third, then widened, tip slightly dorsally extended.

Holotype male, Santa Rosa, California, August 16, 1938, R. H. Beamer; allotype female, 7 male and 9 female paratypes, same place and date, R. I. Sailer. Swept from *Arctostaphylos manzanita* Perry.

NEW GENERA AND SPECIES OF MUSCOID FLIES¹

H. J. REINHARD

College Station, Texas

The present paper contains descriptions of nine new sarcophagine species, including the types of two new genera; all are North American and mainly from Texas. Types of the new species are in my collection.

Camptopsis strigosa, n. sp.

A small pallid fly like the genotype, *C. miamensis*, but more slender in build; ocellars hairlike or entirely wanting; arista long plumose on basal two-thirds; apical scutellars absent.

Male.—Front nearly equibroad from antennal base to vertex, at latter 0.30 of head width; parafrontal gray pollinose, narrower than dark median vitta; parafacial subsilvery, bare or nearly so, hardly as wide as third antennal segment; frontal rows stopping near antennal base; one pair of proclinate orbitals about as large as average frontal bristle; ocellars vestigial or absent; inner verticals long and erect; antennae subequal length of face, reddish, third segment slender, nearly three times longer than second; arista long plumose on basal two-thirds; vibrissae decussate, on oral margin; facial ridges bare; cheek about one-sixth eye height; proboscis short, stout, labella fleshy; palpi slender, yellow with tips slightly infuscated; back of head moderately bulged, rather sparsely black-haired with few pale ones intermixed on lower part.

Thorax black with reddish tinge in ground color of pleura, humeri and scutellum, notum gray pollinose, marked with three dark or brownish vittae sometimes poorly defined; dorsocentral 3,3; acrostichal 0,1; sternopleural 2 (sometimes a hairlike third below); scutellum with 2 lateral pairs, no apicals or discals but a small preapical pair sometimes present; infrascutellum recessive; prosternum finely haired at sides; propleura bare; sides of postnotum beneath calypters setose; calypters glassy white, hind lobe distinctly longer than wide.

Abdomen rather slender, slightly elongate, pale yellow in ground color with an indistinct dark median vitta above which usually expands on third segment to include hind margin; pollen on upper surface somewhat tessellated; first and second segments without median marginal bristles, third and fourth with marginal row; hypopygium pale yellow, first segment rather large and convex behind, with a row of slender hairs on apical margin, second much smaller, reddish; forceps rather short, divided apically but not divergent; penis short, terminating in a subglobular tip; fifth sternite concealed, yellow; fourth tergite beneath with numerous long black hairs on inner apical margin.

¹ Contribution No. 892, Division of Entomology, Texas Agricultural Experiment Station

Legs reddish yellow tarsi blackish; middle tibia with one anterodorsal bristle and a few long fine hairs on inner side; hind tibia with denser vestiture of villous hairs and hind coxae with fine short hairs on posterior side; claws and pulvilli elongate.

Wings hyaline; first vein with a few setulae on middle section, third setulose nearly to small cross vein; first posterior cell open shortly before wing tip; costal spine small but distinct; epaulet pale yellow.

Length, 6-7.5 mm.

Holotype male, Babylon, L.I., N.Y., July 25, 1936 (Blanton and Borders). Paratypes: 8 males in Cornell University Collection, Lakeville, L.I., N.Y., July-September, 1921 (H. C. Hockett), Baiting Hollow and Wading River, L.I., N.Y., August 19 and 26, 1923, without collector's label.

Tejasomyia, n. gen.

A small to medium-sized species well narrowed in build, which differs from *Comasarcophaga* mainly in having three postsutural dorsocentrals; frontal rows scarcely divergent anteriorly, with only one bristle beneath antennal base.

Head wider than high, frontal profile a little longer than facial; oral axis about four-fifths antennal, latter near or just below eye middle; clypeus only slightly sunk, flattened facial ridges bearing a few small hairs next to vibrissae; latter rather stout, decussate, well above lower edge of head; epistoma gently bowed forward and slightly produced downward in oral membrane, hardly at all narrowed from clypeus; parafacial with scattered fine hairs above extending downward in an irregular row to near lower edge of eye; male with well developed outer verticals and female with two pairs of proclinate orbitals; ocellars strong, proclinate; eye bare, reaching nearly to vibrissal level; antennae moderately slender, second segment elongate and fully three-fourths length of third; arista long-haired to short plumose on basal two-fifths above, middle segment short; cheek nearly two-fifths eye height; palpi clavate, subequal length of haustellum. Thoracic chaetotaxy: acrostichal 0, 1; dorsocentral 2, 3; intraalar 2 (none near suture); supraalar 3; postalar 2; presutural 1 (outer); posthumeral 1; humeral 3; sternopleural 1, 1 (sometimes a weak intermediate bristle present); scutellum with 1 small discal and 2 strong lateral pairs, no apicals; infrascutellum not developed; prosternum and propleura bare; sides of postnotum beneath calypters sparsely haired; hind lobe of latter longer than wide. Abdomen rather narrow, ovate; first segment without median marginals and second with one pair in male (usually stout); third and fourth segments each with a marginal row; male hypopygium rather small, first segment with marginal row of good-sized bristles above. Legs moderately stout, male claws and pulvilli elongate. Wings normal in shape; first vein setulose on middle section and third almost to small cross vein; first posterior cell narrowly open far before wing tip; hind cross vein joining fourth much nearer bend than small

cross vein; last section of fifth vein two-fifths length of preceding section; costal spine strong, well over to nearly twice length of small cross vein.

Genotype: *Tejasomyia nexilis*, n. sp.

Tejasomyia nexilis, n. sp.

Male.—Front at vertex 0.32 of head width (average of four specimens), equibroad downward nearly to antennal base; parafrontals and parafacials silvery gray; frontal vitta deep reddish to brown, subequal parafrontal width; antennae red third segment usually somewhat infuscated beyond middle; arista brownish, thickened on basal fourth; palpi red; back of head somewhat bulged or convex in profile, sparsely pale-haired below middle.

Thorax black, gray pollinose, notum with the usual 3-5 dark vittae; calypters opaque, white.

Abdominal black apex of anal segment and hypopygium red, dusted with gray pollen above which shows three shifting black stripes in most views; forceps separated, each prong grooved on basal half behind, tapering to a sharp tip and gently bowed in profile; accessory plate minute, beset with fine hairs; front and hind clasper short, terminating in a simple tip; penis with a short but slender stalk, jointed near base and bearing a large anterior lobe on each side near apex, later triangular hoodlike in profile; fifth sternite reddish, lobes widely divergent with inner margin beset with thick black stubby hairs becoming longer toward apical extremity.

Legs black; middle femur with comb; hind and middle tibiae with variable villosity usually rather sparse and short and sometimes entirely wanting.

Wings hyaline with a faint uniform brownish tinge; veins including costa yellow; bend of fourth V-like, bearing a short stump or fold; epaulets black, subepaulets pale yellow.

Female.—Front at vertex 0.35 of head width in the single specimen, widening gradually downward to antennae; parafrontal wider than median vitta; antennae wholly red; abdomen about as wide as thorax, broadly truncate at tip, anal segment wholly red, genitalia concolorous the orifice sub-oval fringed with black hairs; hind and mid tibiae not villous, claws and pulvilli short.

Length, 7-8 mm.

Holotype male and allotype female, College Station, Texas, May 2, 1943 and May 17, 1942 (H. J. Reinhard). Paratypes: 2 males, same data as type and 1 male, Pleasanton, Texas, March 22, 1937 (C. E. Heard).

Euphyto pollinaris, n. sp.

A small, slender pale gray species closely resembling the genotype, *E. subopaca*, but with basal antennal segments and palpi reddish and abdomen wholly pollinose above.

Male.—Head quadrate in profile, gray pollinose, vibrissal axis subequal length of antennal; front gradually widening from antennae to vertex, latter 0.49 of head width; frontal vitta densely pollinose except on anterior ex-

trinity, at middle much wider than parafrontal; inner verticals erect or slightly convergent, outer pair smaller but distinct; ocellars long, proclinate and divergent; one proclinate and one reclinate orbital, set far back on parafrontal near upper edge of eye; frontal bristles rather weak, in a single row along outer margin of frontal vitta, stopping at base of antennae; face hardly receding, clypeus deeply depressed to middle, thence bowed forward, epistoma moderately narrowed, short; vibrissae barely differentiated, on oral margin; facial ridges and parafacials bare, latter subequal clypeal width; antennae reaching below middle of face, third segment black, barely longer than second; arista shorter than antenna, bare, bowed and thickened on basal three-fifths, intermediate segment slightly longer than wide; cheek one-third eye height, with minute scattered hairs on lower margin; eyes bare; haustellum rather slender, about one-half head height; palpi long, slender with tips slightly swollen; back of head somewhat bulged, densely gray pollinose and sparsely clothed with short black hairs.

Thorax and scutellum black with uniform dense pale gray pollen, notum not distinctly vittate. Chaetotaxy: humeral 2; posthumeral 1; notopleural 2; presutural 1 (outer); acrostichals not differentiated; dorsocentral 1, 3; intraalar 2 (none near suture); supraalar 1 (large); postalar 2; sternopleural 1, 1; scutellum with 1 lateral, 1 large decussate apical and 1 small discal pair; infrascutellum recessive; propleura and prosternum bare; calypters opaque, white.

Abdomen narrow, long ovate, black, wholly gray pollinose above but hind margin of last three segments appearing darker in some views; third and anal segments with a marginal row of rather short bristles; venter subshining, black; sternites exposed; hypopygium rather broad, curved beneath tip of abdomen, basal segment black with a few minute hairs near apex on hind side.

Legs black, tibiae and tarsi with a more or less distinct reddish tinge in ground color; mid tibia with two smallish bristles near middle on outer front side, hind tibiae not ciliate; fore tarsi normal; claws and pulvilli equal length of apical tarsal segment.

Wings hyaline, veins including costa pale yellow; first posterior cell closed, with short petiole reaching costa far before wing tip; bend of fourth vein obtusely angulate, without stump or fold; first vein bare, third setulose over halfway to small cross vein; last section of fifth vein one-half length of preceding; hind cross vein about midway between bend and small cross vein; costal spine vestigial.

Female.—Similar to male but the abdomen wider and more pointed apically; genitalia not adapted for piercing; claws and pulvilli small; fore tarsi stout, with apical segments noticeably flattened.

Length, 6.5 mm.

Holotype male and allotype female, College Station, Texas, April 19, 1920 (H. J. Reinhard). Paratypes: 1 female same data as type and 1 female same locality, May 2, 1921 (H. J. Reinhard).

Sphenometopa violae, n. sp.

Allied to *S. tergata*, but grayer in general aspect; arista thickened on basal two-fifths; apical scutellars large and decussate; male front slightly wider, less shiny and basal segment of fore tarsi modified.

Male.—Front at vertex 0.38 of head width, a trifle narrower at base of antennae; median vitta, parafrontals, parafacials and cheeks with heavy subshiny cinereous pollen; frontal bristles rather weak, in single row near margin of vitta converging toward antennae, two bristles beneath base of latter; one reclinate and two proclinate orbitals; ocellar triangle small, bearing a pair of hairlike divaricate bristles neither distinctly proclinate nor reclinate; verticals two pairs but outer one weak; face deeply impressed, its ridges moderately divergent downward, bristled to upper third or more; parafacial narrowed to width of third antennal segment on lower extremity, bearing a median row of very fine black hairs; vibrissae on oral margin, rather short and approximated; antennae reaching nearly to vibrissae, blackish basal segments short, third about five times length of second; arista black, micropubescent, middle segment short; eyes bare, large reaching to or a trifle below vibrissal level; cheek clothed with fine black hairs, about one-seventh eye height; proboscis short, stout, labella large; palpi black, subequal haustellum length, slightly thickened beyond middle; back of head clothed with short black hairs.

Thorax densely gray pollinose, lateral margin of scutellum subshiny black, notum indistinctly vittate; dorsocentral 2, 3; acrostichals, inner pre-sutural, anterior intraalar and pteropleural not developed or vestigial; sternopleural 2; scutellum with 2 lateral and 1 slightly shorter decussate apical pair; prosternum, propleura and sides of postnotum beneath calypters bare; latter opaque white; infrascutellum not developed.

Abdomen gray pollinose but first segment thinly so, intermediate segments each with three shiny black triangular spots on apical half which are sometimes united on third to form a continuous black cross band; fourth segment polished black with uninterrupted pollinose band on basal half; second and third segments with a pair of median marginal bristles, fourth with a marginal row; genitalia rather small, retracted; inner forceps short, divided on apical two-thirds, prongs moderately divergent and each tapering to fine point; outer forceps thicker but almost as long as inner ones, narrowed apically to blunt or rounded apex; penis stalk grooved on hind side and pale membranous in front, with a subsegment arising near middle curved down and rearward over notched apex of main segment, viewed from side the region enclosed by curved process is pale membranous in texture; fifth sternite broadly emarginate on apical margin, inner angles of lobes rather pointed, sparsely fine-haired.

Legs black; fore basitarsus somewhat widened near apical third by an angular expansion of lower margin which bears a cluster of longish black hairs and a fringe of shorter ones extending along margin to apex; middle tibia with one bristle on outer front side near middle; hind tibia with a

row of rather even but short and widely spaced bristles on outer posterior edge, one near middle stouter and longer; claws and pulvilli minute.

Wings subhyaline; first vein bare, third with two or three minute hairs near base; first posterior cell narrowly open well before extreme wing tip; hind cross vein strongly oblique to fourth, joining same about one-fourth distance from bend to small cross vein; fourth vein beyond bend almost in plane of hind cross vein; costal spine vestigial, epaulets black.

Female.—Front about as wide as in male, median vitta opaque brown with blackish tinge, at middle three to four times parafrontal width; facial ridges bristled on lower three-fifths to two-thirds; third antennal segment slightly exceeding three times second; fore tarsi simple; genitalia telescopic, retracted, terminating in a blunt-tipped larvipositor; otherwise similar to male.

Length, 5-6.5 mm.

Holotype male and allotype female, College Station, Texas, June 7, 1942 (V. E. and H. J. Reinhard). Paratypes 34 males and 11 females, same locality as type, May 15-June 17, 1942-43; 1 female, Agri. Col., Miss., July 16, 1922; and 1 female, Amherst, Ohio, August 13, 1941 (H. J. Reinhard). The species is named for my wife who collected a good portion of the type series mainly from aphid-infested foliage to which the flies had been attracted by a light sprinkling of "honey-dew."

***Sphenometopa planitarsis*, n. sp.**

Agrees closely with the preceding species but at once distinguished by the simple fore tarsi in the male sex. One female included here agrees with the two available male specimens in having second antennal segment reddish in ground color; frontal vitta pollinose but less thickly so; palpi brown, distinctly longer than haustellum; and first segment of fore tarsus ordinary, equal to combined length of the two following segments.

Length, 5.5-6 mm.

Holotype male, College Station, July 18, 1934 (H. J. Reinhard). Paratypes 1 male, same data as type and 1 female, Bexar County Texas, May 7, 1928 (H. B. Parks).

***Gymnoprosope latifasciata*, n. sp.**

Similar to *G. polita*, but with distinctly wider pollen bands on abdominal segments two to four; face less receding and arista thickened well beyond middle. There are also genitalic differences.

Male.—Front at vertex 0.42 of the head width (two specimens), converging slightly toward antennal base; frontal vitta pale reddish yellow, gradually widened to vertex, at middle about four times wider than parafrontal; latter subsilvery becoming darker near vertex; verticals two pairs, well developed, one reclinate and two proclinate orbitals; frontals rather weak, about five bristles in row extending from base of antennae to slightly above mid front; ocellars about as large as orbitals, proclinate; face deeply impressed, its ridges practically bare and scarcely divergent downward; vib-

antennae rather short, decussate, near oral margin; parafacial silvery, sparsely beset with minute pale hairs, nearly equal clypeal width; cheek about one-fourth eye height, concolorous with parafacial, mostly bare but with some black hairs along lower margin; antennae subequal length of face, basal segments reddish, third black, four to five times longer than second; arista blackish, bare, about equal length of third antennal segment, thickened on basal two-thirds; eye bare; proboscis moderately slender, haustellum about one-half head height; palpi yellow, slender with extreme tip slightly thickened; back of head flat, gray pollinose, sparsely clothed with short black hairs.

Thorax black, gray pollinose, with three dark dorsal vittae, middle one narrower, becoming obsolete shortly behind suture; scutellum black dusted with changeable gray pollen. Chaetotaxy: acrostichals not differentiated; dorsocentral 2, 3; intraalar 2 (middle one vestigial); supraalar 2 (none next to suture and the hindmost small); postalar 2; sternopleural 1, 1; pteropleural 1 (small); notopleural 2; humeral 2; posthumeral 1; presutural 1 (outer); scutellum with 2 lateral (the hind one large) and 1 good-sized decussate apical pair, no discs; infrascutellum recessive; calypters opaque, white; propleura and prosternum bare.

Abdomen long ovate, shining black with silvery pollen on basal two-fifths or more of last three segments, the pollinose bands sharply limited at side and not extending on venter; first segment without median marginals, second with one strong pair, last two segments each with a marginal row; genitalia small, retracted, blackish; inner forceps slender, short, divided but not divergent, viewed in profile the hind edge straight, tapering to an acute tip; outer forceps tinged with red basally, thicker, tips blunt and slightly bowed toward apex of inner pair; fifth sternite shining black, with a moderately deep U-shaped apical incision, lobes sparsely beset with short black hairs.

Legs black, fore femora silvery on outer side; claws and pulvilli minute; mid tibia with one bristle on outer front side near middle; hind tibia with two unequal bristles on outer posterior side.

Wings rather short, hardly reaching apex of abdomen; subhyaline with a slight uniform grayish tinge; fourth vein with a rectangular bend, thence strongly concave, approaching costa at an oblique angle and narrowly closing first posterior cell far before wing tip; third vein setulose over halfway to small cross vein; last section of fifth vein about two-fifths length of preceding; hind cross vein not very oblique to fourth, joining it nearly midway between small cross vein and bend; costal spine strong; epaulets blackish, subepaulets pale yellow.

Female.—Front at vertex 0.40 of the head width (one specimen); third antennal segment largely reddish, about three and one-half times length of second; arista reddish; palpi clavate; thorax and scutellum densely gray pollinose, latter with a small pair of discal bristles; pollen bands on last three abdominal segments slightly wider and more defined than in male,

the apical one extending downward on sides to venter on anal segment; genitalia small, retracted.

Length, 4-5 mm.

Holotype male and allotype female, College Station, Texas, July 17, 1917 (H. J. Reinhard). Paratype: 1 male, same data as type.

Gymnoprosope milanoensis, n. sp.

Similar to the preceding species from which it differs mainly as follows:

Male.—Front at vertex 0.35 of the head width; face more strongly receding; parafacial with a row of black bristly hairs along inner margin and scattered smaller ones outside of main row, about two-fifths clypeal width; arista micro-pubescent, thickened on basal two-fifths; haustellum rather stout, hardly one-third head height; palpi slightly bowed near middle and thickened distally.

Thorax black, dusted with gray pollen tinged with brown on notum which shows two broad widely separated black vittae and a narrower median one visible in most angles before suture. Chaetotaxy as mentioned above.

Abdomen long ovate; basal two-fifths to half of last three segments with whitish pollen which is somewhat changeable and interrupted along median line on intermediate segments when viewed in a flat rear angle; outer genital forceps reddish yellow on broad basal part, terminating in a slender inwardly bowed fingerlike process; inner forceps blackish, divided beyond middle but not divergent, viewed in profile the hind edge sloping sharply from a prominent base to middle thence gradually narrowed to an acute simple tip.

Legs moderately bristled; front pulvilli equal length of apical tarsal segment, claws somewhat shorter.

Wings extending to or slightly beyond tip of abdomen, with an even faint brownish tinge; costal spine usually exceeding length of small cross vein.

Female.—Front at vertex 0.37 of the head width; third antennal segment black, wider than parafacial and three to four times second; abdomen more broadly ovate; genitalia retracted; claws and pulvilli minute; otherwise as in male.

Length, 4-5.5 mm.

Holotype male and allotype female, Milano, Texas, May 18 and 25, 1941, (H. J. Reinhard). Paratypes 6 males and 7 females, same data as type.

Opelodexia, n. gen.

Differs from *Opsodexia* in having the prosternum and propleura bare, vibrissae well above oral margin, calypters smaller, etc.

Head wider than high, antennal axis near or just above eye middle, a little longer than vibrissal; facial profile slightly concave and about three-fourths length of frontal, latter strongly sloped and faintly arcuate; face moderately impressed, its lateral ridges flattened, bearing one bristle

and a few small hairs on lower extremity; epistoma moderately produced downward, scarcely narrowed from clypeus or bowed forward from plane of same; front at vertex a trifle over width of ocellar triangle, much narrowed before latter and thence widening evenly downward into face; inner verticals erect; ocellars proclinate, parallel; frontal bristles in a single row, extending from base of antennae to near mid front, upper one or two pairs much reduced in size or hairlike; antennae reaching lower third of face, first segment flush, short second segment about one-half length of third; arista rather long, slightly thickened at base, proximal segments short, plumose nearly to tip; parafacials narrow, bare on lower half; haustellum short and rather stout, labella large; palpi slender with tips slightly thickened; eyes bare, large, descending to vibrissal level; cheeks about one-fifth eye height; back of head convex below but flattened above middle, sparsely clothed with black hairs. Thoracic chaetotaxy: acrostichal 1, 1; dorsocentral 2, 3; humeral 2; posthumeral 1; presutural 1 (outer); notopleural 2; intraalar 2; supraalar 3; postalar 2; sternopleural 1, 1; pteropleural 0; scutellum with 1 lateral, 1 apical (both large, divaricate) and 1 small discal pair; sides of postnotum beneath calypters haired; infrascutellum recessive; calypters rather small, hind lobes barely wider than long. Abdomen subconic, longer and narrower than thorax; last three segments with row of marginal bristles and a discal row on fourth; genitalia rather small, retracted; sternites exposed. Legs moderately long; claws and pulvilli a little shorter than apical tarsal segment. Wings normal in shape; first vein bare, third with two bristly hairs near base; first posterior cell narrowly open to closed at wing tip; bend of fourth vein broadly rounded, without stump or fold; hind cross vein straight to slightly bowed, joining fourth nearly midway between bend and small cross vein, costal spine strong, doubled.

Genotype: *Opelodexia artata*, n. sp.

Opelodexia artata, n. sp.

Male.—Front at vertex 0.18 and at base of antennae 0.29 of head width (average of three specimens); ocellar triangle small and slightly raised, ocellars as strong as average frontal; parafrontals very narrow, gray pollinose, with a row of minute hairs below middle, which extends downward on parafacials to aristal level; frontal vitta reddish to deep brown or black, broad at base of antennae but narrowed to width of anterior ocellus before triangle; antennae red basally third segment infuscated on apical half or more; arista reddish to brown; parafacials and cheeks gray pollinose, latter with sparse and rather coarse black hairs; palpi reddish.

Thorax and scutellum black, with opaque gray pollen, no defined dorsal vittae even before suture, calypters transparent, whitish with a tawny tinge.

Abdomen black, wholly gray pollinose above with a narrow dark median vitta visible in most views; venter with thinner pollen and more shiny; genitalia blackish, inner forceps short, base behind slightly keeled, nar-

rowed tips divided and a little divergent; fifth sternite largely concealed, with a broad U-shaped apical incision, lobes beset with fine black hairs.

Legs black, tibiae with reddish tinge in ground color, middle pair with one submedian small bristle on outer front side; hind tibiae with a row of four widely spaced bristles on outer posterior edge; pulvilli pale tawny.

Wings with a strong yellow tinge extending nearly to hind margin, latter grayish hyaline; venation light yellow; epaulets reddish on basal half or more.

Female.—Similar to male except for sexual differences.

Length, 6 mm.

Holotype male and allotype female, "Greenville, N. C., June 10, 1921."

Paratypes: 2 males same data as type and 1 male Fairfax, S. C., June 16, 1932 (E. W. Howe).

Opelousia mitis, n. sp.

Smaller than the genotype, *O. obscura*, from which it is readily distinguished in having but one lateral scutellar bristle, wholly black antennae, palpi and genitalia. Additional differences are mentioned below.

Male.—Front at vertex 0.14 of head width, strongly narrowed before ocellar triangle thence widening rapidly downward to antennal base; frontal vitta velvety black, tapering upward and reduced to a line at triangle which is small and somewhat elevated; frontal bristles small, extending from narrowest part of front to base of antennae; ocellars proclinate, not divergent; inner verticals weak, suberect; parafrontal very narrow and blackish above, with denser shiny plumbeous pollen below middle; antennae nearly equal length of face, third segment rounded on apex, hardly one-half longer than second; arista black, moderately thickened on basal third, latter with short hairs on upper side, penultimate segment slightly longer than wide; parafacial narrow, plumbeous, with a few minute hairs above descending about to level of arista; face grayish black, not strongly impressed, lateral ridges flattened, bare except at lower extremity; vibrissae on oral margin; epistoma as wide as clypeus, and nearly in plane of same; eyes bare; cheeks grayish black, fully one-fourth eye height; proboscis short; palpi moderately long with tips thickened; back of head blackish, clothed with rather sparse black hairs.

Thorax and scutellum black, faintly subshining with rather uniform thin grayish pollen tinged with brown on notum, latter not vittate. Chaetotaxy: acrostichal 0, 1; dorsocentral 2, 3; intraalar 2; supraalar 2 (anterior one large); humeral 2; posthumeral 1; presutural 1 (outer); notopleural 2; postalar 2; sternopleural 1, 1; pteropleural 0; scutellum with 1 strong lateral, 1 decussate apical and 1 weak or hairlike discal pair; infrascutellum recessive; prosternum and propleura bare; lateral postscutellar plates setose; halteres yellow; calypters semitransparent, tawny.

Abdomen black, wholly gray pollinose with a narrow median black vitta visible in a rear view; intermediate segments each with a marginal row but the two median pairs hardly larger than hairs on second; anal

segment with a discal and marginal row; genital segments small, retracted; inner forceps slender, shining black, rather strongly divergent from near base to tips; fifth sternite black, prominent, with a broad U-shaped apical incision, lobes moderately black-haired.

Legs black tibiae tinged with yellow on apical half or more, weakly bristled; claws and pulvilli hardly equal length of apical tarsal segment.

Wings subhyaline with yellow tinge which becomes more diffused along posterior margin; fourth vein with a broad gentle bend thence almost parallel with hind margin of wing reaching costa at exact wing tip; first posterior cell narrowly open; first vein bare, third with two or three small hairs near base; hind cross vein straight, perpendicular to fourth which it joins about midway between small cross vein and bend, latter without stump or fold; epaulets black; costal spine small but distinct.

Length, 4 mm.

Holotype male, Gillam, Manitoba, Canada, August 10, 1937 (D. G. Denning), donated by Dr. F. M. Snyder.

NEW DOLICHOPODIDAE FROM MICHIGAN (DIPTERA)¹

F. C. HARMSTON and G. F. KNOWLTON
Logan, Utah

The four species of flies here described as new were present in a collection taken by Mr. R. R. Dreisbach in Michigan, and sent to the authors for identification.

Neurigona sombrea n. sp.

Male. Length, 3 mm.; wing 3 mm. Face wide for a male of this genus, its sides nearly parallel, yet somewhat narrowed toward the middle, the silvery pollen nearly obscuring the black ground color. Front black, with thin white pollen, which is more conspicuous along the orbits and immediately above the base of antennae. Proboscis and palpi yellowish-brown, the latter with a conspicuous black bristle near the apex. Antennae yellow; third joint brownish, pointed, densely long pubescent; arista long, tapering, short pubescent, inserted in a notch at upper apical portion of third joint. Postorbital cilia wholly black.

Dorsum of thorax dull yellow, the prescutellar depression brownish; bristles of dorsum strong and prominent. The scutellum bears two strong mesial and two feeble lateral bristles. Pleurae yellow, with a darkened area just below and behind the base of wing. Abdomen blackish; the extreme posterior margins of the first three segments yellowish; venter yellowish. Hypopygium concolorous with abdomen; the inner organs prominent and of complex structure.

¹ Contribution from the Department of Entomology, Utah Agricultural Experiment Station.

² Graduate Assistant and Research Associate Professor of Entomology, respectively

Coxae and all of legs yellow, yet the extreme tips of the tarsal segments narrowly darkened. Anterior surfaces of fore and middle coxae with minute black hairs and a few black bristles at tip, posterior coxae with a prominent black bristle on outer surface. Middle and posterior femora each with a single preapical bristle. Tarsi of plain structure. Joints of fore tarsi as 20-14-11-6-5; of middle tarsi as 20-12-10-6-4; of posterior tarsi as 10-20-12-9-5. Halteres pale yellow; calypters yellow with wide black apical margin, their cilia black.

Wings grayish hyaline; third and fourth veins nearly parallel beyond the posterior cross-vein; last section of fifth vein two times the length of posterior cross-vein; anal angle not prominent, evenly tapering toward the base of wing.

Described from three males, taken in Midland County, Michigan, by R. R. Dreisbach. The holotype, male, was collected June 6, 1941; one paratype taken June 27, 1941, and the other June 27, 1941. The type to be deposited in the United States National Museum; a paratype returned to Mr. Dreisbach and one deposited in the insect collection of the Utah State Agricultural College.

Taxonomy. *Neurigona sombrea* n. sp. is the second species of the genus to be described from North America possessing black postorbital cilia. The other species, *nigricornis* Van Duzee, differs from *sombrea* in having black antennae and the knobs of halteres infuscated. The wholly yellow halteres, black orbital cilia and yellow antennae of *sombrea* readily distinguish it from other species occurring in North America.

***Dolichopus michiganus* n. sp.**

Male. Length, 3.4 mm.; wing 3.2 mm. Face moderately wide, bright silvery pollinose. Front metallic green, lightly dusted with brownish pollen. Antennae black; third joint slightly longer than wide, obtusely pointed. Palpi black, with white pollen. The black orbital cilia descend to about the middle of the eye; the lower cilia are silvery-white, flattened and scale-like.

Thorax metallic, of a beautiful violet color; pleurae dull metallic, greenish-violet, lightly greyish pollinose. Abdomen metallic green, the incisures blackish; lateral portions greyish pollinose. Hypopygium blackish, of moderate size; its lamellae white with narrow black border, somewhat triangular but with rounded apical portion which is jagged and bristly.

Coxae and femora greenish-black, nearly concolorous with pleurae. Anterior coxae with delicate white hairs on anterior surface, and a few black bristles at extreme tip. Middle and hind femora each with a single preapical bristle. Middle femora with a row of delicate black cilia on lower inner edge, the length of these cilia being about one-third the width of middle femora. Hind femora with long black cilia on lower inner edge, the longest of these equaling twice the width of posterior femora. Fore and middle tibiae yellow. Posterior tibiae black and distinctly thickened on apical half, the black shading into brownish-yellow at base; on the inner surface of posterior

tibiae are many delicate blackish cilia, particularly prominent on basal half; the black bristles on outer apical half of posterior tibiae are long and conspicuous. Fore and middle tarsi blackened from tip of first joint. Posterior tarsi black; the basitarsi conspicuously thickened and bearing about fifteen coarse bristles on posterior surface. Joints of fore tarsi as 10-4-3-3-3; of middle tarsi as 15-8-6-4-4; of posterior tarsi as 12-10-8-5-4. Calypters, their cilia and the halteres pale yellow.

Wings grayish hyaline; costa with a small elongated, knot-like enlargement at tip of first vein; last section of fourth vein bent near its middle, slightly convergent toward third vein at apex of wing; anal portion moderately prominent, evenly rounded.

Described from one male, taken in Saginaw County, Michigan, July 14, 1940, by R. R. Dreisbach. Type, male, to be deposited in United States National Museum.

Taxonomy. This species is readily distinguishable from other North American *Dolichopus* in possessing flattened, scale-like lower orbital cilia and long black cilia on lower inner surface of posterior femora. The densely bristled posterior surface of hind basitarsus offers another excellent distinguishing character.

Hercostomus flutatus n. sp.

Male. Length, 3 mm.; wing 2.8 mm. Face wide, slightly narrowed on lower portion, silvery pollinose. Front densely silvery pollinose, the ground color obscured. Orbital cilia black. Antennae black; third joint nearly twice as long as wide, short pubescent, ending in a sharp point, the lower portion gently rounded. Arista dorsal, long and tapering, short pubescent, inserted near the middle of the third joint. Palpi and proboscis yellow, their hairs and bristles black.

Dorsum of thorax black, with a dull greenish luster; scutellum with one pair of stiff mesial bristles and a pair of small lateral hair-like bristles; pleurae dull greenish-black, thickly dusted with white pollen. Abdomen metallic green, the lateral portions whitish pollinose; venter yellow. Hypopygium black, of moderate size; outer lamellae small, yellow, with jagged margins, the posterior surfaces and apical portion with brownish hairs and bristles.

Coxae yellow; anterior surfaces of fore and middle pairs clothed with black hairs and a few black bristles at tip; outer surface of posterior coxae with a strong black bristle near the middle and a small hair-like bristle near the apex. Femora and tibiae yellow; the middle and hind femora each with a single preapical bristle. First two joints of fore tarsi yellow; third and fourth joints black, laterally compressed, fringed above with short black hairs; fifth segment white. Middle and posterior tarsi infuscated from the tip of first joint. Length of fore tarsal joints as 20-15-7-6-6; of mid tarsi as 20-15-9-7-6, of posterior tarsi as 12-15-9-7-6. Halteres and calypters yellow, the latter with black cilia.

Wings grayish hyaline; fourth vein convergent toward the third nearer the middle of last section, from which point they are nearly parallel; anal angle of wing evenly rounded, moderately prominent.

Described from one male, taken in Bay County, Michigan, May 24, 1941, by R. R. Dreisbach. Type, male, to be deposited in the United States National Museum.

Taxonomy. *Hercostomus flutatus* n. sp. is the third member of the genus to be described from North America in which one or more of the fore tarsal segments are white. The three species, *flutatus*, n. sp., *dreisbachi* n. sp. and *albipodus* H. & K., are separated by characters listed in the following key:

1. Lower postorbital cilia white; fourth and fifth segments of fore tarsi white *albipodus* H. & K.
 Postorbital cilia entirely black 2
2. Fifth segment of fore tarsi black on basal half, white on apical half;
 third joint of antennae scarcely longer than wide, rounded at tip
 *dreisbachi* n. sp.
 Fifth segment of fore tarsi white; third joint of antennae twice as long
 as wide, sharply pointed *flutatus* n. sp.

***Hercostomus dreisbachi* n. sp.**

Male. Length, 3 mm.; wing 2.8 mm. Face silvery white, considerably narrowed on lower portion. Front dull, metallic green, densely silvery pollinose. Palpi pale yellow. Orbital cilia wholly black. Antennae black; third joint scarcely longer than wide, rounded at tip.

Thorax dull green, thickly dusted with white pollen; pleurae like the dorsum, except that the pollen is more dense, nearly obscuring the ground color. Abdomen metallic green, the lower lateral portions greyish pollinose. Hypopygium small, black, scarcely larger than the fifth abdominal segment; lamellae small, yellow, triangular with the apical portion pointed, the posterior surface and margins covered with yellow hairs. There are, immediately caudad to the yellow lamellae, a pair of black forked appendages.

Coxae yellow, the middle pair infuscated upon outer surface; anterior surface of fore and mid coxae with scattered, minute black hairs and a few black bristles at tip, posterior coxae with a prominent black bristle upon outer surface. Femora and tibiae yellow; middle and posterior femora each with a single preapical bristle. First and second joints of fore tarsi yellow, the latter slightly blackened at extreme tip; both joints long and stalk-like; third and fourth joints black, conspicuously flattened laterally; fifth joint black on basal half, white on apical half. Middle tarsi black from the tip of first joint. Posterior tarsi wholly black, yet the basitarsi are somewhat yellowish on extreme base. Joints of fore tarsi as 20-20-4-4-3; of middle tarsi as 24-18-10-8-4; of posterior tarsi as 10-20-8-6-5. Calypters and halteres yellow; the cilia of calypters appear brown in some lights, while in others their color is more yellowish.

Wings grayish hyaline; fourth vein convergent toward the third from near the middle of the last section, at their tips the veins are separated by a distance equal to one-half the length of posterior cross-vein; anal angle evenly rounded, moderately prominent.

Described from one male, taken in Midland County, Michigan, June 19, 1941, by R. R. Dreisbach, in whose honor the species is named.

Taxonomy. This very interesting *Hercostomus* is readily distinguishable from the other North American species in the color and form of anterior tarsi. No other described species from North America has the fifth joint of fore tarsi white with basal half of joint black. In *H. albigodus* H & K., described from Utah, the fourth and fifth segments of fore tarsi are white, but in this species the second joint is only about one-half the length of first joint; whereas in *dreisbachi* n. sp. the first two joints of fore tarsi are of equal length. *H. flutatus* n. sp. differs from the two foregoing species in having third segment of antennae twice as long as wide, sharply pointed at tip, and the fifth segment of fore tarsi white.

THE BITE OF A LACEBUG, *CORYTHUCHA CYDONIAE* (Fitch)

R. I. SAILER

Bureau of Entomology and Plant Quarantine, Agricultural Research
Administration, United States Department of Agriculture

The lacebugs (Tingidae) comprise a numerous and well-known family of Hemiptera, easily recognized in most genera by the delicate lacelike effect of the forewings and the lateral expansions of the pronotum. Although all members of the family are plant feeders, I have heard, directly and indirectly, of instances in which people have believed themselves bitten by one of these insects. The latest report received was from W. E. Hoffman, who states that he was bitten by a lacebug on May 12, 1944, while visiting at Asheville, N. C. On July 24, 1944, it was my own fortune to experience the bite of a specimen which I have identified as *Corythucha cydoniae* (Fitch), a form common on various species of the Rosaceae, particularly quince, cotoneaster, *Amelanchier*, and *Crataegus*.

While standing in the aisle of a crowded Washington bus, I felt a pricking sensation accompanied by an itching on the upper surface of my forearm. Resisting the inclination to scratch, I looked for the cause and discovered the lacebug resting quietly on the surface, obviously engaged in piercing the skin with its stylets. About a minute later it ceased biting and proceeded to crawl among the hairs, coming to rest a half inch away. Again it pierced the skin, causing a pronounced pricking sensation and adding to the already annoying itch. This procedure was repeated four times in the following quarter hour. At no time did the insect remain in what would normally be a feeding position more than 3 minutes.

On leaving the bus, I disposed of the lacebug and observed that the area of approximately 1 square inch over which it had crawled was somewhat reddened and itching. After scratching the spot to my satisfaction I proceeded homeward. One hour later the area was still somewhat redder than the surrounding portion of the tanned forearm. After 3 hours only six small reddish spots were to be seen, each the site of an observed bite. The following morning no evidence of the bites remained.

It has long been common knowledge that many hemipterons will attempt, for some reason as yet not altogether explained, to thrust their stylets into any surface upon which they alight; however, a careful survey of the literature has uncovered no evidence that anything has previously been published showing lacebugs to be capable of producing the type of annoyance here recorded.

TWO NEW RACES OF BUTTERFLIES

DON B. STALLINGS and DR. J. R. TURNER*

Caldwell, Kans

Euphydryas anicia bakeri, new race.

For the time being we place this as a race of *anicia* as its general appearance and genitalic characters seem to be closest to this species.

This race is close to race *hopfingeri* (Gunder), but is slightly larger. The upper surfaces of both sexes of *bakeri* have even more extended white areas than *hopfingeri* and the black markings are thicker. The marginal red band on both wings is generally narrower. The white areas in *bakeri* appear to be truly white, while the corresponding color in *hopfingeri* appears yellowish. This may be due in part to the increased white area in *bakeri* (and hence a corresponding decrease of the red). The red in *bakeri* does not have the orange cast that is found in *hopfingeri*. On the undersurfaces this race varies from *hopfingeri* in the same manner as the upper surfaces, i.e. increased white area and heavier black markings.

Holotype: Male. Expanse 42 mm. Cave Creek, Durkec, Oregon.
4-27-41. Elevation 2640'.

Allotype: Female. Expanse 48 mm. Cave Creek, Durkee, Oregon.
4-29-41. Elevation 2640'.

Paratypes: 27 males, 5 females. Same location, collected during
May of 1940; April, May and June of 1941 and June of 1943.

Collected by Mr. and Mrs. J. H. Baker, in whose honor we name this race. Holotype and allotype will be placed in the United States National Museum. Paratypes will be placed in various museums and private collections.
Euphydryas anicia effi, new race.

* In the armed services.

From general appearance and genitalic examination we place this as a race of *anicia*.

This race is also close to *hopfingeri* but is smaller. The upper surfaces of both sexes differ from *hopfingeri* and *bakeri* in the development of the black which is much more prominent than in either of the other two races. The red marginal band is narrower than in *bakeri*. The white areas (which have a slight yellowish cast) are about the same as in *bakeri*. This is accomplished at the expense of the red areas. The sub-mesal row of red spots across the hind wings is heavily enclosed with black and in many of the females these red spots are pupilled with black. Under surfaces very similar to *bakeri*.

Holotype: Male. Expanse 34 mm. Corral Creek, Ketchum, Idaho.
7-12-44. Elevation 6200' to 7500'.

Allotype: Female. Expanse 42 mm. Corral Creek, Ketchum, Idaho.
7-12-44. Elevation 6200' to 7500'.

Paratypes: 48 males and 52 females, Corral Creek and Proctor Mt.,
Ketchum, Idaho. Collected during July of 1944.

Collected by Mr. and Mrs. Donald Eff, in whose honor we name this race. Holotype and allotype will be placed in the United States National Museum. Paratypes will be placed in various museums and private collections.

A NEW SPECIES OF DIKRANEURA FROM ARIZONA (Homoptera-Cicadellidae)

R. H. BEAMER
Lawrence, Kans

Dikraneura curiosa, n. sp.

Resembling *D. kunzei* (Gill.) but vertex of male almost as long as distance between eyes and aedeagus with two pairs of processes, each of which has a sharp tooth. Length 2.5 mm.

Head cone-shaped, with quite a blunt apex. General color of head, pronotum and scutellum ivory, tinged with yellow. Vertex practically unmarked, pronotum semihyaline on basal two thirds and scutellum with a semblance of two darker median parallel lines connected apically by a U-shaped mark. Elytra almost opaque, bluish-green with a small black spot at apex of clavus and tinged with yellow in region of costal plaque. Front dark, legs lighter.

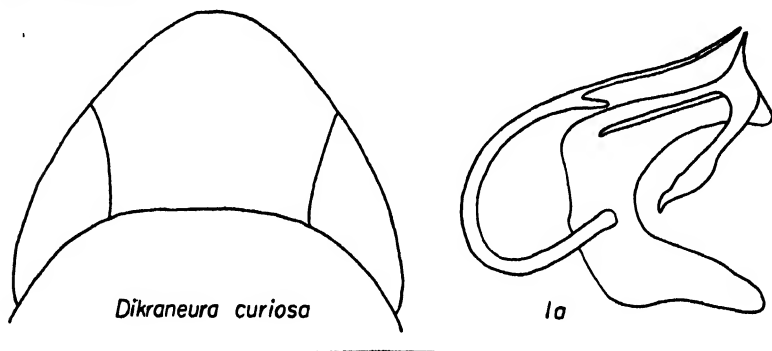
Internal genitalia: Pygofer narrowed apically into a heavy, blunt, blackened point. Aedeagus in dorso-ventral view with an exceptionally broad base with four diverging prongs. In lateral view shaft twice as broad at base as near apex, bent caudally at right angles just before middle with two pairs of processes, one pair arising ventrally at bend in shaft, the other pair arising laterally near base of shaft. The first pair parallels shaft to its apex where

the processes enlarge more than twice their width, send off a short, sharp spine ventrally, bend dorsally and then narrow to two thirds apical diameter, curve backward to end near base of shaft. About apical half of this latter, bent portion is again enlarged to end in quite narrow, clawlike apex. The other pair of processes, arising on the sides of the shaft near the base, proceeds in a large curve back of base, bending ventrally to parallel the shaft to its tip. Each process divides near beginning of first pair of processes into a short, stout outer part and a long, narrow inner one.

Holotype ♂ and 3 paratype ♂s, Santa Rita Mts., Ariz., July 17, 1932, R. H. Beamer, and 1 paratype ♂, Patagonia, Ariz., August 21, 1935, R. H. Beamer.

Doctor Melvin Griffith dissected the first specimens of this species during his study of the genus *Alconeura* and attached a label with the following apt remark: "Curious involved aedeagus."

Types in the Snow Entomological Collections, University of Kansas, Lawrence, Kansas.



TWO INTERESTING INSECT SPECIES

GEO. A. DEAN

Department of Entomology, Kansas State College,
Manhattan, Kans.

The Department of Entomology received by mail from Southeastern Kansas Dec. 28, 1944, one adult soldier fly and two puparia of *Hermetia illucens* Linn. and two larvae of *Dermestes lardarius* Linn., which had been taken in a milk station. The adult fly was taken on the window and the puparia and larvae in the accumulations in the cracks of the floor where leaking milk cans had been stored and milk had run out on the floor. No doubt the souring milk and other materials in the cracks of the floor produced a favorable odor to attract larder beetles and soldier flies to places for depositing eggs. Probably some of the flooring was somewhat decayed, and thus with the souring milk getting into it, formed a favorable breeding or feeding place for the larvae.

PRICE OF BACK VOLUMES

Back Volumes \$2.00 per volume

Subscriptions for back volumes or numbers should be sent to Donald A. Wilbur, Entomology Department, Kansas State College, Manhattan, Kansas.

CONTENTS OF THIS NUMBER

A Revision of the Genus <i>Stragania</i> (<i>Bythoscopus</i> of Authors) in America North of Mexico (Homoptera, Cicadellidae).	
R. H. BEAMER and PAUL B. LAWSON	49
New Genera and Species of Muscoid Flies.	
H. J. REINHARD	67
New Dolichopodidae from Michigan (Diptera).	
F. C. HARMSTON and G. F. KNOWLTON	77
The Bite of a Lacebug, <i>Corythucha cydoniae</i>.	
R. I. SAILER	81
Two New Races of Butterflies	
DON B. STALLINGS and DR. J. R. TURNER	82
A New Species of <i>Dikraneura</i> from Arizona (Homoptera, Cicadellidae).	
R. H. BEAMER	83
Two Interesting Insect Species.	
GEO. A. DEAN	84

Journal of the Kansas Entomological Society

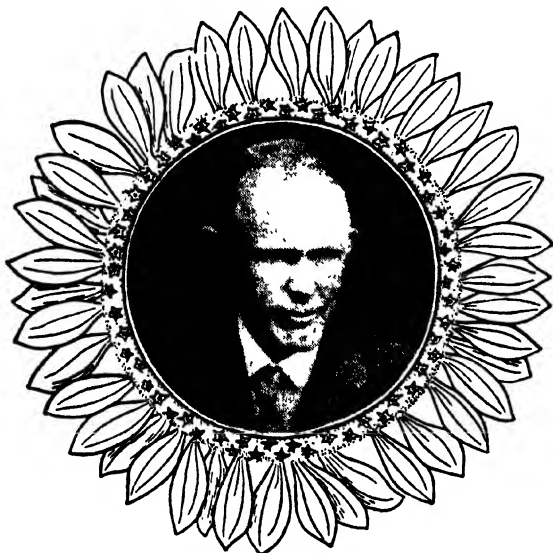
Volume 18

July, 1945

Number 3

PUBLICATION COMMITTEE

PAUL B. LAWSON, Editor, Lawrence
R. H. BEAMER, Lawrence R. H. PAINTER, Manhattan
DWIGHT ISELY, Fayetteville, Ark.



JAMES WALKER McCOLLOCH
1889-1929

Entered as second-class matter June 7, 1939 at the Post Office at
Manhattan, Kansas, under the Act of August 24, 1912.

JOURNAL OF THE KANSAS ENTOMOLOGICAL SOCIETY

A quarterly journal published in January, April, July and October devoted to Entomology in the Western Mississippi Basin and the proceedings of the Kansas Entomological Society.

Manuscripts for publication may be sent to any of the publication committee.

The Kansas Entomological Society does not make exchanges since the Society does not maintain a library.

Subscription to the Journal must be paid in advance. The subscription rate is so low that second notices are not ordinarily sent out.

Payment of Canadian or other foreign subscriptions and bills must be made by international Postal Money Order or by a draft on a New York bank and payable in U.S.A. dollars.

Subscribers are urged to give us their full cooperation in these matters.

Subscriptions should be sent to Donald A. Wilbur, Department of Entomology, Kansas State College, Manhattan, Kansas.

Subscriptions in the U.S.A.,	\$1.50 per year	Single Copy
Canadian or foreign subscriptions,	1.75 per year	60 cents

KANSAS ENTOMOLOGICAL SOCIETY

President, H. H. Walkden, Hutchinson, Kansas

Vice-president, Paul B. Lawson, Lawrence, Kansas

Secretary-Treasurer, Donald A. Wilbur, Manhattan, Kansas

Vol. 18, No. 3, July, 1945

This issue mailed July 28

THE FOURTEENTH OR 1944 ANNUAL INSECT POPULATION SUMMARY OF KANSAS¹

GEO. A. DEAN,² ROGER C. SMITH² and E. G. KELLY³
Kansas Agricultural Experiment Station

This insect population summary for Kansas covers the calendar year 1944 and is the fourteenth in a continuous series which began with the year 1931.¹ The information recorded here is based on a summary of 287 questionnaires of the score card type from the sources indicated in Table I together with the observations and comments of the authors, their colleagues and of those returning the score sheets.

Table I. Source and Numbers of Questionnaires Summarized for this Report

	No. in July	No. in October
Group 1. Entomologists in the state	0	5
Group 2. County Agriculture Agents	65	62
Group 3. Farmers, mostly college graduates	35	8
Group 4. Vocational Agricultural Teachers	51	61
Total reports of each group	151	136
Grand total of all questionnaires summarized for this report	287	

Summary of Weather Conditions (Fig. I and Table II) in Kansas by Months During 1944.²

January was 4.5° above normal, making it the mildest January since 1938 and one of the mildest on the state's record. There was a record-breaking fall of moisture in the western part mostly in the form of snow. The mild weather over practically all of the state the latter part of the month was most favorable for the wheat crop.

¹Contribution No. 542 from the Department of Entomology

²Entomologists of the Agricultural Experiment Station

³Extension Entomologist, Extension Division

Recognition and appreciation for assistance given during the preparation of this summary are due to the same sources and largely to the same individuals who supplied information for recent, previous reports. They consist of the persons grouped in Table I.

⁴For the other summaries in this series, see the *Journal of the Kansas Entomological Society* for the summaries for 1931 (vol. 5); 1932 (vol. 6); 1933 (vol. 7); 1936 (vol. 10); 1937 (vol. 11); 1939 (vol. 13); 1942 (vol. 16); and for 1943 (vol. 17) and the *Transactions of the Kansas Academy of Science* for 1934 (vol. 38); 1935 (vol. 39); 1938 (vol. 42); 1940 (vol. 44) and for 1941 (vol. 45).

⁵Notes and Table II based on Climatological Data: Kansas Section, Weather Bureau, U. S. Dept. of Commerce by S. D. Flora. Vol. 58, 1944

February weather was mild, with frequent and ample precipitation mostly in the form of snow which made the month favorable for the wheat crop over Kansas, though field work was hampered by wet soil much of the time. The average precipitation for the state was 1.22 inches which was more than any February in the previous 15 years.

March came very nearly being a record-breaker for wet and unseasonable cold and cloudy weather over the entire state, which caused the spring work to be from three to four weeks behind the season in many localities. It was favorable, however, for wheat. The average precipitation for the state as a whole was 2.96 inches, which was 1.52 inches above normal and exceeded only in 1892 and 1922. It was a month of steady cold with no extremes of high or low temperatures.

April was a record-breaker over Kansas for heavy and frequent rains and excessive cloudiness. It also nearly broke the record for abnormal coolness. There were devastating floods in the eastern and south-central portions and farm work was at a stand-still through almost the entire month. The average precipitation for the state as a whole was 7.25 inches, which was almost three times the normal amount and the greatest ever recorded for April and the greatest total for the first four months of the year. Rains occurred almost every day after the first week in all parts of the state. Freezing weather occurred in all parts and with frequency in the northwestern counties. Very little damage to crops occurred, however, due to the late season.

May had an abundance of moisture and was generally warm and sunshiny weather after the first week, which made it favorable for crop growth. The first week, however, was cold with a freeze on the 5th and 6th in all parts of the state, except the extreme southwestern counties. The rain was heavy over the southwest quarter and several southeastern and extreme northeastern counties, but was somewhat below normal over a large area. Most of the rain fell on the first 3 days and the last week.

Crops were behind the season, but grew well. Few spring crops were far enough along to be damaged by the general freeze on the 5th and 6th. Planting corn was delayed by the wet cold weather the first week and hampered by hard, crusted upper soil the third week of the month. Cutting the first crop of alfalfa and planting grain sorghums began the last week.

June was warmer than usual, but deficient in rainfall in many parts of the state. Heavy local rains occurred in a number of places with dry weather prevailing in adjacent localities. Hail storms were numerous and damaging. The month was favorable for maturing and harvesting wheat. Corn made an excellent growth. In the southeastern counties, some of the crop had been laid by and was beginning to tassel. The first cutting of alfalfa was made and by the closing week the second crop was almost ready to cut.

July was unusually cool and cloudy over Kansas with near record-breaking rainfall over the western two-thirds of the state. The average in the

western third was 5.54 inches; and for the state as a whole, 4.73 inches, which was the greatest amount for July since 1922. The mean temperature for the state, 77.4° , was 1.8° below normal, making it the coolest July since 1927. It was an exceptionally favorable month for corn, especially in the western two-thirds of the state. By the close of the month the crop was in the roasting ear stage in the eastern part of the state in silk and tassel elsewhere. Grain sorghums, soybeans, and broom corn made a fine growth. Pastures, alfalfa and sweet clover were excellent. Wheat harvest was completed rather early in the month, except in the western part of the state where it was materially delayed by heavy rains. Heavy weed growth, lodging, black stem rust and shattering of unharvested wheat materially reduced the yield of crop. Also there was considerable spoilage from wheat being piled on the ground on account of a shortage of storage and shipping facilities.

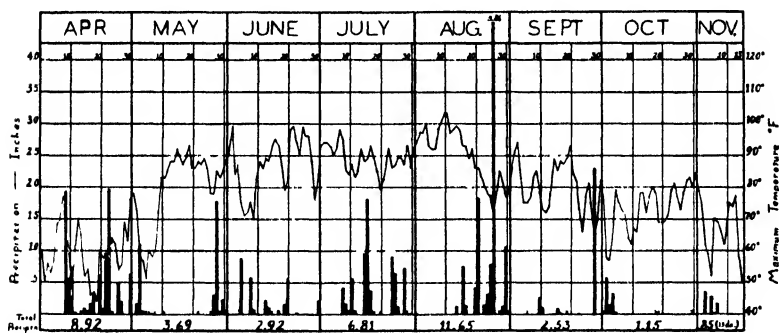


Fig. 1. Daily rainfall and temperature chart for the growing season of 1944, at Manhattan, Kansas. Chart prepared by D. A. Wilbur.

August was a month of frequent and heavy rains over the eastern two-thirds of Kansas, which gave that section with one exception (August 1927) more rain than had ever fallen in August since the state-wide record was begun 57 years ago. The average for the state as a whole was 5.63 inches. The extreme western part of the state was decidedly deficient. The mean temperature for the state was 77.9° , which was normal. It was an exceptionally favorable month for crop growth and left the soil in good shape for fall seeding, except in some of the extreme western counties. Pasture, alfalfa, grain sorghums, and broomcorn grew well. Sowing wheat began in the western counties the closing week.

September was a month with heavy rains in the southeastern and south-central parts, but deficient in the northern and western counties and decidedly deficient in the extreme western portion. There were some warm periods during the month, but in general, it averaged below normal and

Table II. Summary of Weather Data for the State of Kansas for the period September 1, 1943 to December 31, 1944

Month	Temperature in degrees Fahrenheit				Precipitation in inches							
	State Mean	Maximum	Minimum	Mean for 38 years	Departure from normal	State Average	Average for 38 years	Departure from normal	Eastern third	Middle third	Western third	
September, 1943	67.5°	102°	29°	69.7°	-2.2°	2.39	2.82	-0.43	4.19	2.42	0.57	
October	55.8°	96°	11°	57.3°	-1.5°	1.67	1.98	-0.31	2.45	1.96	0.59	
November	42.5°	82°	9°	43.2°	-0.7°	0.22	1.26	-1.04	0.30	0.20	0.15	
December	30.8°	68°	-21°	33.2°	-2.4°	1.50	0.87	+0.63	2.11	1.59	0.81	
January, 1944	34.4°	73°	-21°	29.9°	+4.5°	1.09	0.69	+0.40	0.67	0.89	1.70	
February	36.3°	80°	-20°	33.2°	+3.1°	1.22	0.99	+0.23	1.59	1.27	0.80	
March	39.2°	77°	2°	43.3°	-4.1°	2.96	1.44	+1.52	4.17	3.15	1.55	
April	49.4°	85°	12°	54.8°	-5.4°	7.25	2.64	+4.61	8.89	6.85	6.02	
May	66.4°	99°	25°	63.9°	+2.5°	3.90	3.81	+0.09	3.68	3.45	4.58	
June	75.4°	112°	41°	73.9°	+1.5°	2.93	4.02	-1.09	4.56	2.69	1.55	
July	77.4°	106°	46°	79.2°	-1.8°	4.73	3.13	+1.60	3.73	4.94	5.54	
August	77.9°	110°	39°	77.9°	0°	5.63	3.19	+2.44	8.30	6.75	1.85	
September	69.2°	103°	29°	69.7°	-0.5°	1.92	2.81	-0.89	2.95	2.12	0.69	
October	58.9°	91°	25°	57.3°	+1.6°	1.73	1.97	-0.24	2.29	1.65	1.25	
November	45.7°	85°	5°	43.3°	+2.4°	1.96	1.27	+0.69	2.71	2.01	1.15	
December	30.8°	64°	-5°	33.1°	-2.3°	2.15	0.90	+1.25	3.58	2.02	0.86	
Averages or total for 1944	55.1°	112°	-21°	55.0°	-0.1°	37.47	26.86	+10.61	47.13	37.79	27.54	

there was more cloudiness than usual in September. Most of the rain occurred during the last four days. Light frost was reported on the 24th in a few northwestern localities. Sowing wheat was nearly completed by the close of the month. Early seeding came up to good stands, except in the extreme west, where there was a lack of soil moisture. Practically all corn and grain sorghum crops matured and much was cut for silage and fodder. Prairie hay and alfalfa hay harvest was completed. Proomcorn was cut in the southwestern counties and soybean harvest began in the eastern part of the state. Pastures dried up somewhat but had an excellent carrying capacity.

October was mild, sunshiny and pleasant weather prevailed over the state with little rainfall after the first week. The last half of the month was exceptional Indian-summer weather. No snowfall was reported. The rainfall, which was somewhat below normal except in the southeastern and some western counties, was well distributed over the state. The soil moisture was ample, except in a few western counties. Light freeze and killing frosts were reported on the 12th over most of the western half, north central portion, and in the extreme northeastern part. Elsewhere there were only light to heavy frosts. Wheat seeding was completed and good stands covered the ground. Fine weather the latter part of the month enabled the farmers to catch up with their work, fill the silos and get much of the corn picked, with per acre yields the highest in more than 60 years. Plenty of rough feed was in sight, and pastures were in good shape.

November was a month of exceptionally mild fall weather and an ample fall of moisture in nearly all parts of Kansas. It was favorable for the growth of wheat, husking corn and threshing grain sorghums. There was, however, an excessive amount of cloudiness. The rainfall was well distributed, but barely sufficient for the western counties where the crop had rank top growth and required much moisture. Wheat made an unusually fine fall growth and furnished good pasture for livestock. Grass pastures were excellent, corn husking three-fourths completed in many of the eastern counties, and harvesting and threshing the record breaking crop of grain sorghums was more than half completed, but lacked storage and shipping facilities.

December was excessively cloudy, and one of the wettest on record over the eastern half of the state and above normal over the western half. Heavy rains the first week caused the December overflows along the rivers in southeastern Kansas, which overflows were among the greatest ever known by these streams. This was followed by heavy snow fall over most of the state, making it too muddy, except when frozen, for farm work and for pasturing wheat. The mean temperature was 30.8° making it the coldest December in 12 years. Snowfall for the month totalled from four to eight inches. It was a favorable month for wheat, but very unfavorable for completing the corn and grain sorghum harvesting and doing farm work.

Crop Production Summary for 1944*

The year of 1944 was excellent for crops in Kansas. Wheat production was estimated at 191,669,000 bushels, making it one of the largest crops in the state and nearly 1/5 of the all time record crop production in the United States. It was exceeded in Kansas only by the 1942 production of 200,101,000 bushels and the 1931 production of 251,885,000 bushels. Excellent yields were obtained in nearly all parts of the state except in the north central parts where the lack of moisture in the fall of 1943, damage by the hessian fly and black stem rust in May and June of 1944 caused a reduction in the yields, and in the western part where poor stands and late emergence occurred in the fall of 1943.

The 1944 corn crop of 114,793,000 bushels was the largest production since 1932. The sorghum grain production of 49,468,000 bushels was more than twice as large as the previous record crop of 21,885,000 bushels produced in 1941. Sorghum forage production totaled 3,088,000 tons or about 15 percent more than 1943. The production of soybeans in 1944 of 3,315,000 bushels greatly exceeded the record of 1942 which was 2,544,000 bushels.

The wet spring delayed planting of oats, barley and flax and resulted in the lowest yields for these crops in several years. Production of oats in 1944 of 28,098,000 bushels was about 59 percent of the 1943 crop and much below the 10-year (1933-42) average production of 35,931,000 bushels. Barley production of 14,348,000 bushels was somewhat less than the 1943 crop. The flaxseed crop for 1944 was 452,000 bushels which was 22 percent of the 1943 crop.

The all hay production in 1944 was estimated at 2,735,000 tons compared with the 2,440,000 tons produced in 1943. The cool, wet spring followed by frequent rains and moderate temperature throughout the summer and late fall, resulted in the largest all hay crop production since 1932.

The 1944 potato crop of 1,144,000 bushels was the smallest in a decade. Adverse weather and field conditions not only caused a large reduction in the acreage planted but also the yield. Colorado potato beetle, flea beetles, and serious potato leaf hopper infestations caused heavy losses.

The alfalfa seed crop for 1944 was estimated at 168,000 bushels compared with 238,000 bushels in 1943; sweet clover seed, 104,000 bushels compared with 96,000 bushels; popcorn was 7,980,000 pounds compared with 4,680,000 pounds in 1943.

Descriptive Account of the More Important Insect Activities and Climatic Relationships During 1944

The alfalfa plant bug, *Adelphocoris lineolatus* was common in Riley County. While this species is uncommon as yet, it appears to be increasing. No severe injury as yet has been noticed.

*From Kansas 1944 Crop Review, Kansas State Board of Agric. Statistics Division, Dec 20, 1944 Mimeographed Release.

Ants. Winged forms of the genera *Cremastogaster* and *Monomorium* were numerous during the summer and early fall. Many inquiries were received as to whether they were termites. Ants found in houses and around steps and walks were reported from 82 counties.

The kafir ant was reported destroying sorghum seed in the St. Marys area.

Several species of **aphids**, such as the elm leaf aphid attacking elm, melon aphid infesting cucumbers, squash and pumpkins, and the corn leaf aphid attacking corn in northeast Kansas occurred in outbreak numbers.

Pea aphids which occurred in outbreak numbers in south central Kansas during March and April of 1943, appeared in a few counties of the same area during the spring of 1944, but there was practically no damage except in a few small spots. The heavy rains in April and May, together with the rapid growth of the alfalfa, no doubt was responsible for the failure of the aphids to injure the alfalfa plants. During the mild late fall there were in the alfalfa fields many adults, numbers of which were winged.

The green bug which threatened to cause severe injury to wheat and oats in 1943, and which caused some injury in small local areas in twelve of the southern and central counties, did not appear in noticeable numbers during the spring of 1944. It was reported June 16, however, by Dr. R. H. Painter in the heads of barley at Hays and Dr. E. G. Kelly reported it in the fall and early winter in a number of fields, causing in some instances brown spots in the wheat fields.

Cutworms during the early summer were reported widely over the state. Apparently the heavy rains prevented serious injuries or hastened recovery of the plants. They were scored at 2 in 33 counties; 3 in 23 counties and 4 in 3 counties.

Pale western cutworm, which became a serious pest in western Kansas, especially in the northwest, during the severe drought years, were not able to withstand the favorable growing years of 1943 and 1944. They were not reported as present.

Armyworms reported June 19, by Dr. Painter, were working on wheat heads at Fort Hays Agricultural Experiment Station. The wheat was lodged and the larvae cut off the heads.

Fall armyworms were observed to have been abundant in southeastern Kansas where they did considerable damage to Balbo rye, which was planted early for fall pasture.

Bagworms probably were somewhat more numerous and destructive in the eastern third of the state than in 1943 or in any previous year. They were scored at 3, 4 and 5 in many counties. They also were reported farther west than ever before, such as in Decatur County in the northwest and Mead County in the southwest.

Bean leaf beetles were numerous and destructive to bean foliage in Riley County and several counties in southeastern Kansas.

Bees did well in 1944. The Division of Statistics of Kansas estimated, Oct. 1944, honey production from 44,000 colonies of bees at 1,760,000 pounds of

honey compared with 1,672,000 pounds in 1943. The average production per colony was 40 pounds compared with 35 pounds in 1943 and 51 in 1941. The cold, late spring and heavy rains in April and May hindered early activity and deficient rain fall in June reduced the honey flow of sweet clover. There was a small smartweed nectar flow in some areas in August and September. The demand for honey was exceptionally good. There was little swarming during 1944.

Black crickets were reported as a nuisance and pest by 69 counties. They occurred in houses, stores, and fields.

Fleas attacking pets and man were reported from 93 counties. They were scored 2, 3 and 4 by 86 counties and 1 by 7 counties.

Flies of several species developed to abnormally large numbers in 1944 as a response to favorable weather conditions during the spring and summer.

Horse flies (Tabanids) were numerous in areas near woodlands, lowlands, and streams. They were more annoying along streams in western Kansas than usual. The heavy rains and flooded areas in many parts of the state made conditions favorable for the increase of these pests.

Stable flies and **horn flies** were very abundant—the population peaks following the many rains during the wet summer season. They were reported from 96 counties. 45 counties reported 4; 3 reported 5; 47 reported 3. The score numbers indicate this was one of the worst seasons on record.

Buffalo gnats or **black flies** were reported killing setting hens and chickens at Oberlin, Kansas, by C. I. Kern, County Agent, who sent in specimens of the gnats.

Screwworm flies occurred in a medium outbreak in 1944. These worms were brought to Kansas by the large shipments of cattle from the southern states and northern Mexico. The flies and larvae became distributed through the counties in a few months. They increased rapidly and heavy infestations occurred during August and September. The records show that 5,872 farmers treated 34,736 head of cattle in 36 counties. Screwworms were reported from 80 counties. Screwworm infestations of sheep were common in many counties, with serious outbreaks in the vicinities of Woodson, Wyandotte, Leavenworth, Lyon, Franklin, Ford and Republic Counties. More than 600 growers treated with smear 62 and benzol for screwworms or wool maggots.

The sheep bot fly or "grubs in the head" of sheep were abundant in a few scattered areas, and caused some damage and deaths. Since there has been a large increase of sheep in Kansas, the bot fly has apparently increased correspondingly.

Cattle grubs and **cattle lice** occurred perhaps in normal numbers in 1944. The eradication of cattle grubs and lice, which is a major project of the extension work, has given excellent results. These campaigns are major contributions to the war effort. There are approximately 4,000,000 head of dairy and beef cattle in Kansas. There were nearly 8,000 farmers, including

dairymen, who treated about 354,000 head of cattle or a little more than 8 percent for cattle grubs and lice in the 1943-1944 campaign. However, all of the 103 counties were organized for cattle grub and cattle lice control during the spring of 1945.

Horse bot flies were widely distributed in the state and probably were about as abundant as during the season of 1943. Nearly 3000 farmers had veterinarians cooperating with county agents treat 11,099 horses in 59 counties.

The sheep tick fly is one of the big problems for the wool and sheep producer. There were 2,505 growers who dipped 161,208 sheep for ticks. This resulted not only in an increase of lamb weight and wool clip, but also in a satisfied group of sheep producers.

Mosquitoes, due to an abundance of moisture and repeated overflows of streams throughout the state, were a nuisance and a serious annoyance. They were reported from every county except nine in the west fourth of the state. 52 counties scored 3, 27 scored 2, and 4 scored 4.

Box elder bugs were no more plentiful than in 1943. They caused little annoyance in and around homes. An interesting observation was made, by the senior author, of box elder bug nymphs severely injuring strawberries May 22 on a Manhattan property. They were feeding on the ripening and green berries and even the stems. The plants attacked were Senator Dunlap and Blakemore. There were several box-elder trees growing on an adjoining lot in close proximity to the strawberry plants. Many nymphs were in among the plants.

Cankerworms. There was some increase of the fall cankerworm at Manhattan. They reached the peak about February 18 or four days earlier than last year. The infestation of the spring canker worm probably was about the same as in 1943.

Calligrapha scalaris Lec. caused serious damage or defoliation of American elms at Manhattan, Salina, Wakefield, Miltonvale, Clay Center and Concordia. The species was far more abundant than any previous year. The partial defoliation of a few elms at Manhattan and Miltonvale in 1943 was the first report recorded in the state.

Datanas on apple, walnut, oak and sumac did some injury during the summer of 1944.

Hackberry nipple gall has become a serious pest of the hackberry throughout the greater part of eastern Kansas. The leaves begin to turn a light yellow by early summer, become unsightly, commence dropping, and littering the lawn until late fall.

Hackberry petiole gall (*Pachypsylla venusta*) was taken on hackberry at Manhattan this year for the first time. The petiole gall caused a disfiguration of the leaves.

The hackberry bud gall (*P. gemma*) also was taken at Manhattan this year for the first time. It destroyed the leaf buds in some instances.

Green striped maple worm defoliated large numbers of soft maples in Douglas, Jefferson, Atchinson and Doniphan Counties. The infestation should be scored at 4 or 5 in these five counties.

Redbud leaf roller has increased slightly in several parts of eastern Kansas where the infestation was scarcely noticeable during the previous two or three years.

Wood borers in trees of various kinds were reported, but the scores indicated they were less destructive than in the previous two years, and far below the peak of the drought years.

Buffalo treehopper (*Ceresa bubalus* Fab.) caused serious damage during May and June to tomato plants in Riley and Pottawatomie Counties. The young nymphs in feeding on the main stalks partially or completely girdled the stalks, thus killing the plants. The puncturing or girdling took place from the base of the plant to three or four inches above the base.

Cabbage worms were widely reported in the state in 1944, but the damage and numbers were no more than in the years of 1942 and 1943. Reports were recorded from 91 counties, 3 and 4 were scored by more than half of the counties.

Carrot weevils were observed in many gardens in eastern Kansas and caused damage in some gardens. The infestations were no worse than in some previous years, but the insect appears to be spreading westward since it is reported nearly 100 miles from the east border.

Tomato and tobacco hornworms were reported from all parts of the state. Due to the great interest in gardening stimulated by victory garden and 4-H club workers, tomatoes were grown in thousands of gardens. Reports were received from 62 counties of hornworms attacking tomato plants. Apparently they were somewhat more abundant than normal.

Colorado potato beetles were fairly plentiful and reported from 84 counties. While nearly all of the counties were scored 1 and 2, 14 were scored 3, which were widely distributed over the state. They were less numerous and destructive than in the two previous years.

Clover leaf weevils were common in Barber County and doing some visible damage to alfalfa. In one field from 12 to 25 larvae or more per square foot were observed. Crows and gulls were observed on Oct. 20, by Dr. Painter and Professor Wilbur, feeding on them in alfalfa fields.

Cotton-square borer (*Strymon melinus*) or **bean Lycaenid** or **gray hair streak** was reported and observed attacking pods of growing beans, July 14, at Manhattan. This same insect was reported by Dr. R. L. Parker as feeding on lettuce in 1943.

The pickleworm (*Diaphania nitidalis*) (Stoll) was reported attacking green cucumbers in several gardens in the Manhattan area. In some instances they caused serious damage.

The corn earworm during 1944 was somewhat above normal in numbers

and damage to sweet corn, field corn, sorghum heads, and tomatoes. It was scored 3 in 30 counties and 4 in 9 counties.

Codling moths as reported by Dr. R. L. Parker, were numerous and destructive to just about the same degree as in 1943. The frequent heavy rains interfered not only in making the applications of spray materials at the proper time, but they also caused a reduction of the spray residue. More sound apples, however, were produced and marketed in 1944 than in 1943 due to larger production on the trees and more growers doing spraying.

Chinch bugs, despite the rainfall which was far above normal during the growing season of 1944, increased and did considerable damage to corn and grain sorghums over the eastern half of Kansas. The early fall chinch bug survey indicated the presence of bugs over the eastern half of the state far in excess of expectations. A careful survey was then planned in cooperation with the Grasshopper Control Division of the Bureau of Entomology and Plant Quarantine, which survey was made during the last half of November. The Federal agents collected the bunch grass samples while representatives of the Division of Extension and Department of Entomology counted the bugs. As a result of the count, plans were made for an extensive control program in 1945, provided the winter survival of the bugs warranted such a program.

False wire worms again were below normal in western Kansas. They were reported from only 16 counties nearly all of which were in the southwest corner of the state. Five of the counties were scored 3. These pests were of sufficient importance, however, to cause 1229 farmers to use control methods on about 50,000 acres.

Garden webworms occurred in 1944 in mild outbreaks over a large portion of the state and in some parts did considerable damage. Three-fourths of the counties reporting webworm were located in the eastern half. Two counties in southeastern Kansas were scored 4. 24 counties distributed over the state were scored 2. 12 were scored 3 and 10 at 1. The webworm attacked soybeans in southeastern Kansas. Alfalfa was attacked in many fields. The worms were plentiful about mid-July. The crop was cut at the earliest possible date to prevent serious damage, and to prevent damage to the second and third crops. The seed crop also was protected by early cutting.

Grasshoppers. Despite the heavy rains and moisture in the growing season of 1944, grasshoppers increased and caused serious damage to alfalfa and wheat. The deficient rainfall in June probably favored the increase of the hoppers. Fall sown alfalfa and wheat were seriously damaged in more than 80 counties. In western Kansas, grasshoppers became sufficiently important to cause 6077 farmers to use poison bait for control. The bait prevented much damage, and farmers who did not apply bait lost a strip of wheat from two to four rods wide around the border of the fields. The adult and egg surveys indicated that there will be a need for grasshopper control in

1945. The survey and reports in the questionnaires scored 5 in 2 counties, 4 in 9 counties, 3 in 50 counties, 2 in 38 counties, and 1 in 4 counties.

Hessian fly caused less damage in 1944 than during the three previous years. The loss to the 1943 crop was estimated at 25,000,000 bushels, while the loss to the 1944 crop was estimated at 6,000,000 bushels. The hessian fly, however, continued to be the major pest to wheat growers. Dr. Painter has made the following report for the 1944 season.

"The fly infestation in the spring of 1944 occurred late and was distributed over a longer period of time, which resulted in an infestation relatively high up on the culms. In most fields only a relatively small amount of lodging from fly occurred in comparison with the number of culms infested. Parasitism was the highest observed in recent years and apparently was successful in reducing the fly population, especially in north-central Kansas. The earliest fall emergence occurred in the first week in September in north-central Kansas with a second late fall emergence in mid-October. Eggs were also laid in abundance in some wheat fields near Goddard, Sedgwick County. In some fields larvae were still present and apparently alive in January, 1945. The infestation in central Kansas appears to be very spotted and most abundant in Sedgwick, Reno, Sumner, and Kingman Counties."

Fall sown wheat was protected in 1944 by 29,600 farmers observing the recommended hessian fly control measures on about 1,636,100 acres.

Southwestern corn borer. Professor D. A. Wilbur in charge of the southwestern corn borer investigations made the following report of this insect for 1944.

"The total number of counties in which the southwestern corn borer has been taken, including Riley and Greeley Counties where it was first found in 1944, is 63. In all probability, however, infestations are present in from six to ten additional counties. There was an increase in population intensity in 1944 in those counties near the eastern and northern margin of the infested areas. This increase was particularly noticeable in Cowley, eastern Sedgwick, northern Russell, Ellsworth and the southern parts of both Rooks and Osborne Counties. These areas were infested previous to 1944, but without severe commercial damage.

"In a six county area including Kiowa, Edwards, Pawnee, Barton, Stafford and Rice Counties which had severe southwestern corn borer damage since 1941, the corn acreage dropped from 116,200 in 1943 to 44,430 acres in 1944 even though a favorable corn growing season was in prospect.

European corn borer was taken in 1944 for the first time in Kansas. One larva and one pupa were taken in a small sweet corn patch in a victory garden near the Fairfax air base of Kansas City, Kansas. A thorough inspection was made of all sweet corn and field corn growing in Kansas City within two miles of the infested sweet corn patch, but no additional infestation was found. Later a second inspection was made over the same area and although there were many small and large sweet corn areas in ideal

condition for the second generation of the corn borer larvae, no infestation was found. A third inspection was made during the late summer and early fall, but no larvae of the borer were found.

White grubs were reported from 77 counties doing damage to gardens, farm crops and lawns. Four of the counties were scored 4, 11 counties were scored 1, and 72 counties were scored 2 and 3. The **wheat white grub** which causes severe damage some years in the southcentral counties, caused only light damage in the spring of 1944. The good rains and other favorable growing conditions for wheat were contributing factors in favor of the wheat.

Several species of white grubs injured lawn grasses, strawberries, and garden plants.

The **white grub**, (*Cyclocephala immaculata*) is a white grub closely resembling *Ligyris gibbosus*, the adult of which is the carrot beetle. The larvae of the carrot beetles transform to the adult in early fall and pass the winter as such. The larvae of *Cyclocephala immaculata*, however, continues to feed until cold weather, passes the winter in soil, passes into the pupal stage and changes to the adult in the spring. The identification of this grub clears up the mystery of several years—that of white white grubs doing serious injury to wheat in summer fallowed fields. *C. immaculata* is a species that requires only one year from egg to adult. The appearance of this species into the wheat fields may necessitate some changes in tillage to keep it under control. The injury to wheat in 1944 first appeared about the middle of September and continued well into November since the temperatures were above normal during the fall. The damage occurred in areas varying from a quarter of an acre to several acres and even in some instances to the greater part of the field. The damage was reported by farmers, county agents, staff members of Agricultural Experiment Station and Extension Division over the western half of the state. It was more serious, however, in the northcentral and western counties. One of the serious difficulties encountered by the growers are the weedy spots or areas at harvest time. Rank growth of weeds seriously interfere in combining wheat. To overcome or at least to lessen this difficulty, late replanting of the bare areas was recommended. Fortunately the weather conditions in October and November were favorable for replanting and germination. This was done by many of the farmers, and in most instances not only good stands were had, but also little injury from the grubs occurred.

SUMMARY AND CONCLUSIONS

Temperature and moisture

The year of 1944 was the second wettest year on record in Kansas, the wettest being 1915. The average precipitation over the eastern third was 47.13 inches; the middle third, 37.79 inches; and the western third, 27.54 inches. The average was almost 50 percent more than 1943. Bumper crops

resulted from the favorable weather conditions that prevailed almost without a break. The summer months were comparatively cool and pleasant. A comparatively mild, dry autumn prevailed, with the first killing frost deferred until an unusually late date. This permitted the crops to mature and favored fall growth and seeding the new wheat crop. December was exceptionally wet and furnished an abundance of moisture to carry wheat through the winter. The heavy rains caused serious overflows of streams in the eastern third of the state.

Insect Occurrence

Outbreak numbers: Bagworms, green-striped maple worms; grasshoppers in western Kansas and chinch bugs in eastern Kansas, despite the excess rainfall, southwestern corn borer, white grub, *Cyclocephala immaculata* in western Kansas, garden webworm, mosquitoes, *Calligrapha scalaris* in local areas, stable flies, horn flies and horse flies (Tabanids).

More numerous than in 1943: In addition to the insects listed above, the following ones were more numerous than in 1943: bean leaf beetles, termites, cabbage worms, tomato and tobacco hornworms, corn earworms, grasshoppers in eastern Kansas, white grubs, fleas, black crickets, house flies, corn leaf aphids, melon aphids, leaf hoppers, and the redbud leaf roller.

As plentiful as in 1943: House and lawn ants, hackberry nipple galls, elm aphids, screwworm flies, sheep bot flies, cattle grubs, cattle lice, horse bot flies, sheep tick fly, box elder bugs, canker worms, datanas, carrot weevil, Colorado potato beetle, clover leaf weevils, and the codling moth.

Less plentiful than in 1943: Green bug, armyworms, fall armyworms, false wire worms, hessian fly, pea aphids, kafir ant, blister beetles, wood borers.

Scarce: Pale western cutworms; European corn borer which appeared in Kansas for the first time (two specimens taken); hackberry petiole gall was taken on hackberry at Manhattan for the first time.

Table III. Population summary of the more common and important insects in Kansas for 1944, as indicated by questionnaire score sheets from nearly all counties

Key—

1. Scarce.
2. Plentiful, but damage was neither noticed nor reported
3. The species was abundant. Some damage was either seen or reported.
4. Local outbreaks. The species was doing severe damage in certain fields.
5. The species was in general outbreak. The insects were doing their greatest damage or were as plentiful as they ever get in a locality.

Note: This table represents the population scorings by counties for each species of insect listed in the questionnaires, in so far as reported. To use this plate, copy the scores for each species in the counties of a state map.

[illegible]

THE GENUS *KELISIA* IN AMERICA NORTH OF MEXICO
(Homoptera - Fulgoroidea - Delphacinae)

R. H. BEAMER*

The genus *Kelisia* was described by Fieber in 1866 (Verh. Zool. Bot. Ges., Wein 16: 519) with the European species *Delphax guttula* Germar as haplotype. Z. P. Metcalf, in his *Catalogue of Fulgoroidea*, Fascicle IV, Part 3, Araeopidae, lists the following species as occurring in America north of Mexico: *axialis* Van Duzee, *crocea* Van Duzee, *parvula* Ball, and *salina* Ball. The types of all these species have been studied with the exception of *K. parvula* Ball, and drawings of this species and comments on it were made by Doctor J. S. Caldwell of the United States Bureau of Entomology and Plant Quarantine. *Kelisia axialis* Van Duzee is the only species of the four that belongs to this genus.

A cotype male of *Kelisia crocea* Van Duzee, collected at Ames, Iowa, by Professor Herbert Osborn, was studied. It belongs to that group of species placed in *Liburnia* by Metcalf in his recent catalogue not only by the characters of the internal male genitalia, but also by the external characters of both sexes. It is therefore placed in that genus and the specimen mentioned above designated lectotype.

An examination of four pairs of cotypes of *Kelisia salina* Ball revealed two species. Four specimens from Fort Collins, one from Wray, and one from Animas, Colorado, are *Megamelanus frontalis* Crawford. One female from Grand Junction and one male from Lamar, Colorado, are *Kelisia salina* Ball. The above two species are very closely related in external characteristics as well as in the internal male genitalia. *Kelisia salina* Ball is therefore placed in *Megamelanus*, and the female from Grand Junction, Colorado, is here designated lectotype.

Kelisia parvula Ball is a *Delphacodes*, near *Delphacodes wetmorci* Muir and Giffard. This leaves *Kelisia axialis* Van Duzee and seven new species to be considered in this paper.

I wish to thank Doctor L. D. Tuthill of the Department of Zoology and Entomology, Iowa State College, Ames, Iowa, and Doctors C. F. W. Muesebeck, and J. S. Caldwell of the United States Bureau of Entomology and Plant Quarantine for their very helpful cooperation in the study of type material. I am also indebted to Mrs. Alberta Mosier for help with the drawings.

Kelisia Fieber

Calcar foliaceous with coarse black teeth; front tibia normal; antennae terete, first segment about as wide as long; front much longer than wide, sides not parallel, narrowest at base, widest beyond middle, one median

* Contribution from the Department of Entomology, University of Kansas, Lawrence, Kansas.

carina forked at apex; vertex longer than width at base, slightly protruding beyond eyes; pronotum with lateral carina straight, not reaching hind margin.

KEY TO SPECIES OF KELISIA

1. Elytra with a brown or black, longitudinal stripe of regular width from base to tip 2
 Elytra usually without such a stripe 5
2. Dark mark of elytra continued across front *flagellata* n. sp. 3
 Dark mark of elytra not continued across front
3. Black spot on front beneath each ocellus and one on lateral margin of pronotum above coxae *pectinata* n. sp.
 Without black spot in either of these positions or only a very light one on margin of pronotum 4
4. Stripe on elytra very broad, occupying two thirds area *spinosa* n. sp.
 Stripe on elytra narrow, occupying about one third area *curvata* n. sp.
5. Black spot beneath each ocellus and on lateral margin of pronotum above front coxae *bimaculata* n. sp. 6
 Without black spots
6. Black markings of elytra confined to a triangular shaped spot in elytra or none at all 7
 Black markings of elytra heavy at apex and base of elytra and usually narrowly following the second sector *axialis* Van D.
7. Dark stripe on either side of abdomen continued over pronotum *retrorsa* n. sp.
 Dark stripe of abdomen, when present, usually not continued over pronotum *hyalina* n. sp.

1. *Kelisia axialis* Van Duzee

The original description of this species is a very good one. It is as follows: "Form of *K. guttula*; above piceous brown, beneath pale dull testaceous. A wide yellow vitta extends from near the apex of the vertex to the second dorsal segment of the abdomen. Elytra hyaline with anaxial brown vitta. Length 4 mm.

"Vertex tinged with testaceous on the anterior margin; entire face testaceous, obscurely marked with darker on the front next the lateral carinae; antennae yellow, paler toward their tips; eyes rufous; pronotum dark brown from the dorsal vitta to below the lateral margins; meta-, and mesonotum piceous brown with a broad median vitta extending onto the two basal segments of the tergum; lower surface and legs pale dull testaceous; mesonotum with a large brown spot; tarsal spines tipped with black; abdomen blackish brown, the sides of the venter varied with testaceous. Elytra hyaline, with a conspicuous brown vitta from the base to the extreme apex following the line of the second sector; first sector and the two first apical nervures white, the others brown or mostly so; apical nervures four, the interior forked.

"This species may be distinguished from its European congenors by its glassy elytra marked with a conspicuous longitudinal vitta, by the uniformly

testaceous inferior surface, and the absence of the black spots on the cheeks. Described from two examples representing both sexes, taken at Lancaster, New York, in August, 1886."

Male genitalia, lateral view: Styles widest at base, slightly S-curved, tapering gently to outer third, then rapidly to sharp apices. Aedeagus very long and slender with a slight flange before apex ventrally and a pair of short teeth dorsally almost at tip, tip bent ventrally and back basally in a slightly enlarged semihyaline apex. A pair of hairlike processes with enlarged apices arise laterally near base of anal ring and extend slightly beyond tip of aedeagus. Anal tube long and slender without hooks or spines.

The two cotype specimens have been studied. The male is here designated lectoholotype and the female the lectoallotype.

2. *Kelisia flagellata* n. sp.

Brachypterous Form

Resembling *K. axialis* but much smaller with black band of elytra continuous through eyes and across front to tip of elytra and processes on aedeagus without enlargements at tips. Length of male 2.25-2.5 mm.; female 3 mm.

Structure: Elytra widest near apex of scutellum, narrowing to slightly out-curved apices, extending beyond end of abdomen. Wings tiny oval pads.

Color: General color stramineous with a black stripe on elytra from apices to bases between first sector and first claval vein, crossing pronotum and connecting eyes over apex of front, curving slightly toward costal margin near apices of elytra. A dark spot on sclerite above coxae of middle leg. Styles and aedeagus brown, anal ring black. Female ovipositor brown.

Genitalia: Styles about as in *K. axialis*, somewhat wider at base, and sharply narrowed nearer apices. Aedeagus in lateral view long and slender but without the flange on venter and dorsal apical teeth. Processes coiled whip-like, thickest at bases, not enlarged at apices, as long or longer than the aedeagus.

Holotype male, allotype female, and four pairs of paratypes, Douglas Co., Kansas, October 24, 1944, R. H. Beamer; other paratypes, same place and collector; two males and eight females, October 18, 1944; one female, October 19, 1944; four pairs, October 24, 1944; five males and thirteen females, October 26, 1944; twelve males and thirty-five females, November 2, 1944.

Types in Snow Entomological Collections.

3. *Kelisia spinosa* n. sp.

Resembling *K. flagellata* but dark band of pronotum not connected through the eyes and across the front, and anal ring of male with a ventral spine near its base. Length 3.4 mm.

Macropterous Form

Structure: Elytra extending about one third their length beyond abdomen, widest just beyond apex of clavi, apices evenly rounded.

Color: General color buff to brownish, stripe on vertex, pronotum, mesal and costal margins of elytra, white. Elytra brown except very narrow mesal border and area outside of first sector semihyaline to white, brown band extending to eyes but not through them and across front as in *K. flagellata*. Black spot on lateral margin of pronotum just above base of front coxae. Front and clypeus evenly buff colored, remainder of venter mottled with darker. Ovipositor of female and genital segment of male evenly dark brown.

Genitalia in lateral view: Male style slightly S-curved, almost parallel margined on basal three fourths, suddenly contracted on outer fourth to sharp point. Aedeagus long and slender with a lateral notch just before tip, apex coiled backward and slightly enlarged; pair of lateral processes arise near base of anal ring, whiplike, as long as aedeagus, widest at base. Anal ring with a short sharp spine either side near base, at right angles to it.

Holotype male, allotype female, and three male paratypes, Brule, Wis., Aug. 16, 1937, R. H. Beamer; other paratypes: one male, same place and date, C. L. Johnston; one male and one female, New Haven, Conn., Aug. 20, 1934, R. H. Beamer; one male and one female, Rib Mountain State Park, Wis., Aug. 27, 1937, R. H. Beamer; one male, Cedar River, Mich., Aug. 26, 1937, R. H. Beamer; two males, Florence, Wis., Aug. 19, 1937, C. L. Johnston; five males, same place and date, R. H. Beamer; two pairs, Morris, Wis., Aug. 27, 1937, R. H. Beamer; one male, Thompson, Mich., Aug. 25, 1937, R. H. Beamer; one female, Gogebic, Mich., Aug. 18, 1937, R. H. Beamer.

Brachypterous Form

Like the former except the elytra are shorter, widest near base, gradually narrowed to almost pointed apices and the wings are reduced to tiny pads not one fifth as long as elytra. Length 2.5-3 mm.

Holomorphotype male, allomorphotype female and 6 male and 2 female paramorphotypes, Brule, Wis., Aug. 16, 1937, R. H. Beamer; other paramorphotypes: one male, same place and date, C. L. Johnston; one male, Keld, Manitoba, Canada, Aug. 8, 1937, R. H. Beamer; one male, Cowan, Manitoba, Canada, Aug. 7, 1937, R. H. Beamer; one male and two females, New Haven, Conn., Aug. 20, 1934, R. H. Beamer; six males and one female, Florence, Wis., Aug. 19, 1937, C. L. Johnston; three males and one female, same place and date, R. H. Beamer; one pair, Rib Mountain State Park, Wis., Aug. 27, 1937, R. H. Beamer; one pair, Morris, Wis., Aug. 27, 1937, R. H. Beamer; one female, Swan River, Manitoba, Canada, Aug. 2, 1937, R. H. Beamer.

Types in Snow Entomological Collections.

4. *Kelisia retrorsa* n. sp.**Brachypterous Form**

Resembling *K. spinosa* but elytra not darkened except a wedge-shaped

mark at apex, anal segment of male without spines, and processes on aedeagus about half as long as shaft. Length of male 3.25 mm.; female 4.75 mm.

Structure: Elytra longer than body, broadest near tip of scutellum, narrowed at apex, almost sharp pointed, mesal margin rounded toward costal on outer third. Hind wings tiny pads, smaller than one eye.

Color: Stramineous, darker on the sides of the pro- and mesonotum, extended caudally on sides of abdomen as a dark stripe showing through hyaline elytra. Elytra hyaline except wedge-shaped dark spot between two branches of second sector at apex. Ovipositor, outer third of genital segment of male, ventral half of anal ring, dark, and more or less fumose marks on venter.

Genitalia in lateral view: Styles broadest at base, more or less S-shaped, narrowed and sharply bent caudad near outer third, ending in sharply pointed, dorsally curving apices. Aedeagus broadest on basal half, sharply narrowed just before a broad retrorse ventral tooth, beyond, less than half as wide as basal portion, apex turned ventrally and cephalad. A pair of processes arise laterally near base of anal ring, about half as long as aedeagus, whiplike, and widest on basal two thirds.

Holotype male, allotype female, and one pair of paratypes, Cedar River, Mich., Aug. 26, 1937, R. H. Beamer; other paratypes: one male, Itasca Park, Minn., Aug. 11, 1937, H. T. Peters; one male, same place and date, C. L. Johnston; one male, Brule, Wis., Aug. 17, 1937, R. H. Beamer; one male, Bath, N.H., Aug. 21, 1934, P. W. Oman.

Macropterous Form

Like the above but elytra with apices rounded, widest beyond tip of clavus. Hind wings longer than abdomen. Color of tip of elytra tending to extend up the second sector and on clavi from mesonotum.

Holomorphotype male, Eveleth, Minn., Aug. 13, 1937, H. T. Peters; paromorphotype male, Itasca Park, Minn., Aug. 11, 1937, H. T. Peters.

Types in Snow Entomological Collections; paratypes in United States National Museum.

5. *Kelisia hyalina* n. sp.

Brachypterous Form

Resembling *K. retrorsa* but aedeagus in lateral view much narrower, middle retrorse process with additional parts and lateral processes much thicker and heavier to their apices. Length 3.25-4.00 mm.

Structure: Elytra broadest near tip of scutellum, narrowing to rather sharp apices, extending about a fourth their length beyond abdomen. Wings reduced to tiny pads less than half as large as an eye.

Color: General color very light brown with a lighter stripe from tip of ver-

tex to apex of abdomen, on abdomen bordered by an irregular-sided fuscous area on either side. Elytra semihyaline, usually with a dark triangular spot occupying the area between the branches of the second sector, sometimes absent.

Genitalia in lateral view: Styles widest on basal third, slightly S-shaped, rapidly narrowing on outer third to dorsally curving apices. Aedeagus very long and narrow with a peculiar triangular process near middle ventrally, also a pair of lateral processes arising near base of anal ring, about as wide as shaft of aedeagus at middle and carrying this width well toward their apices.

Holotype male, allotype female, sixty-one males and thirty-five females, Douglas Co., Kansas, October 26, 1944, R. H. Beamer; other paratypes: ten males and seven females, Douglas Co., Kansas, October 18, 1944, R. H. Beamer; one pair, Douglas Co., Kansas, Nov. 2, 1944, R. H. Beamer; two females, Lawrence, Kansas, Aug. 23, 1944, R. H. Beamer; one male, Sumner Co., Kansas, Nov. 19, 1925, E. P. Breakey.

Macropterous Form

Like the brachypterous form except elytra longer, widest near apex of abdomen and wings fully developed. Length 4.25-5.25 mm.

Holomorphotype male, allomorphotype female, and one male paramorphotype, Douglas Co., Kansas, October 26, 1944, R. H. Beamer.

Types in Snow Entomological Collections.

6. *Kelisia bimaculata* n. sp.

Brachypterous Form

Resembling *K. hyalina* but with black spot of elytra faded to a smoky line and with two lateral black spots, one on face beneath ocellus and one on side of mesonotum above front coxa. Length 4-4.5 mm.

Structure: Elytra widest near tip of scutellum, tapering to sharp apices about one fourth their length beyond the abdomen. Hind wings tiny pads smaller than an eye.

Color: General color buff with median line from tip of vertex to apex of abdomen lighter. Elytra semihyaline with a semblance of a smoky line from bases to apices, slightly heavier at tips and extending across pronotum to eyes. Lateral margin of front with a sizable black spot beneath ocellus and a black dash on lateral margin of pronotum above base of front coxae.

Genitalia in lateral view: Styles widest at base, rapidly narrowing on outer third to sharp apices, slightly S-shaped. Aedeagus long and slender with a pair of very short lateral teeth about one fourth distance from tip, a three or more pronged process on ventral side near middle and a pair of processes arising near base of anal ring about as long as ring and rather thick throughout.

Holotype male, allotype female and one male paratype, Bath, N.H., Aug. 21, 1934, R. H. Beamer; one male and 2 female paratypes, same place and time, P. W. Oman; one male, Trout Lake, Wis., Aug. 13, 1936, D. M. DeLong.

Types in Snow Entomological Collections; paratypes in United States National Museum and Illinois State Natural History Survey.

7. *Kelisia curvata* n. sp.

Brachypterous Form

Resembling *K. bimaculata* but lacking the black mark beneath the ocellus and on the margin of the pronotum, and with a very distinct black curving band on elytra. Length 3.25-3.75 mm.

Structure: Elytra widest near apex of scutellum, slightly narrowing toward tip, but not nearly so sharp pointed as others in the genus, extending about one fourth their length beyond abdomen. Hind wings reduced to tiny pads about half the size of an eye.

Color: General color stramineous with a light stripe from apex of vertex to tip of abdomen. Dorsum with a black stripe from hind margin of eye and of the same width, to tip of elytra, curving slightly toward costal margin on outer portion to conform to margin of wing. More or less darkening of lateral sclerites above coxae, the larger and more definite one just above the hind coxae.

Genitalia in lateral view: Styles widest near base, slightly S-curved, rapidly narrowing on outer third to sharp apex. Aedeagus long and slender, widest at base, curved ventrally near middle with a peculiar process (see Fig. 7) located ventrally at about basal third, apex slightly swollen and twisted. Basal processes flat, bladelike, more than twice as broad at base as at middle, less than half as long as shaft of aedeagus, curved laterally and dorsally on apical third, with short, sharp process between them at their base.

Holotype male, allotype female, six male and seven female paratypes, Douglas Co., Kansas, October 26, 1944, R. H. Beamer; other paratypes: thirty-seven males and thirty-three females, same place and collector, October 24, 1944; twelve males and three females, Douglas Co., Kansas, Nov. 2, 1944, R. H. Beamer; one pair, Douglas Co., Kansas, July 13, 1944, R. H. Beamer; four males and one female, Okefenoke Swamp, Ga., Billy's Island, July 27, 1939, R. H. Beamer; one male, Columbus, Ohio, Oct. 4, 1940, Parker; one male, Bowie, Md., Oct. 31, 1941, P. W. Oman; one male, Dorchester Co., near Lloyds, Md., July 10, 1907, H. S. Barber.

Macropterous Form

Like the above but with flight wings. Elytra almost parallel-sided to apex of clavi, apices rounded; hind wings longer than abdomen. Length 4-5 mm.

Holomorphotype male, allomorphotype female and one male and four female paramorphotypes, Douglas Co., Kansas, Oct. 24, 1944, R. H. Beamer;

two pairs, same place and collector, Nov. 2, 1944; three males, Washington, D.C., Oct. 5, 1941, P. W. Oman; one male, Dorchester Co., near Lloyds, Md., July 10, 1907, H. S. Barber.

Types in Snow Entomological Collections; paratypes in United States National Museum.

8. *Kelisia pectinata* n. sp.

Brachypterous Form

Resembling *K. curvata* but with a fairly large dark spot on face below each ocellus and another rectangular spot on lateral margin of pronotum just above front coxae. Length 4-4.5 mm.

Structure: Elytra widest near apex of scutellum, tapering to long, almost sharp apices. Hind wings tiny pads, smaller than an eye.

Color: General color stramineous with a light stripe from apex of vertex to tip of abdomen. Elytra hyaline with a median longitudinal brown stripe about as wide as eye running from tip to base and crossing pronotum to eye. Front with an angular black spot below each ocellus. Rectangular black spot on lateral margin of pronotum above front coxae, and two more lighter brown spots in a line caudad of this. Margin of abdomen with a row of more or less definite light brown spots on either side.

Genitalia in lateral view: Styles widest at base, slightly S-shaped, rapidly narrowed on a little more than outer third to sharp apices. Aedeagus very long and narrow, widest at base, narrowed near middle, usually with a pectinate ventral process with five teeth just before this contraction, shaft widened on outer third, in dorso-ventral view apex broadened with a short sharp diverging process on either side of a swollen middle portion from which the ejaculatory duct protrudes; pair of processes at base of anal ring widest near their middle, wider than aedeagus, narrowed and curved ventrally on outer third, set with short sharp teeth in this region.

Holotype male, allotype female and one male and three female paratypes, Douglas Co., Kansas, Oct. 26, 1944, R. H. Beamer; other paratypes: two males and four females, Douglas Co., Kansas, Oct. 19, 1944; five males and one female, Douglas Co., Kansas, Nov. 2, 1944; one male, Douglas Co., Kansas, Oct. 18, 1944; one pair, Lawrence, Kansas, Aug. 23, 1944; two females, Lawrence, Kansas, Sept. 1, 1944, all collected by R. H. Beamer; five males and five females, Meade Co., Kansas, Sept. 13, 1944, R. H. Beamer; one female, Sand Dunes, Medora, Kansas, June 21, Don Wilbur.

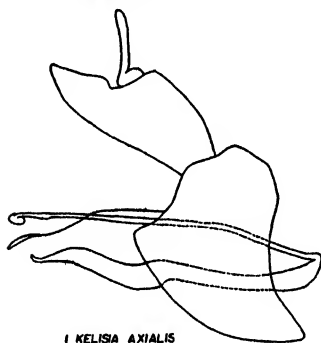
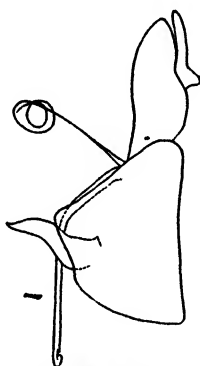
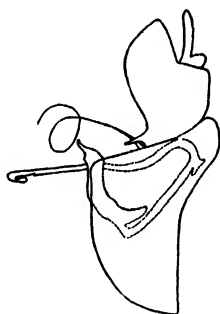
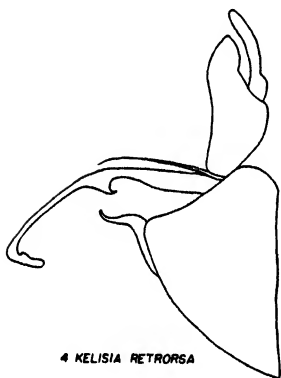
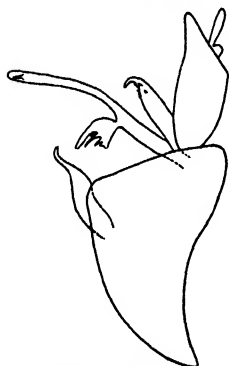
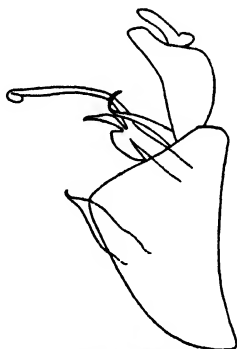
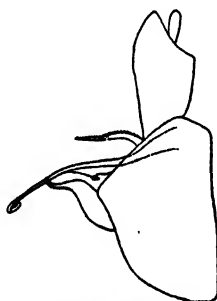
Macropterous Form

Just like the above except elytra widest near apices of clavi, tips more broadly rounded, extending one third their length beyond abdomen and the hind wings fully developed. Length 4.5-4.75 mm.

Holomorphotype male and three paramorphotype males, Douglas Co.,

Kansas, Oct. 19, 1944, R. H. Beamer; allomorphotype female, same place and collector, Oct. 18, 1944.

Types in Snow Entomological Collections; paratypes in United States National Museum.

1 *KELISIA AXIALIS*2 *KELISIA FLAGELLATA*3 *KELISIA SPINOSA*4 *KELISIA RETRORSA*5 *KELISIA BIMACULATA*6 *KELISIA PECTINATA*7 *KELISIA CURVATA*8 *KELISIA HYALINA*

SIPHONAPTERA: A NEW SPECIES OF CONORRHINO- PSYLLA FROM KANSAS¹

WILLIAM L. JELLISON, *Sanitarian* (R)
United States Public Health Service

Several collections of fleas from the nests of wood rats, *Neotoma floridana*, taken near Lawrence, Kansas, by R. H. Beamer and his associates in biology at the University of Kansas, represent an undescribed species of *Conorhinopsylla*.

Conorhinopsylla is a very distinct genus of fleas and so far is known only from North America. It is known only by the genotype *C. stanfordi* Stewart, of which both sexes have been described and figured by Stewart (1), Jordan (2), and Ewing and Fox (3).

Conorhinopsylla nidicola, n. sp.

This species is closely related to *C. stanfordi* but is readily distinguished by the modified abdominal segments of the male which are figured. In *C. stanfordi* the finger (F) and process (P) of the claspers are projected posteriorly on a much elongated lobe. This is not prominent in *C. nidicola*. In *C. stanfordi* the finger of the clasper is almost covered by the broad oval process as figured by Jordan (1937). In *C. nidicola* the process covers only a small basal portion of the finger. In *C. stanfordi* the posterior arm of sternite IX is long and tapering and exceeds sternite VIII. It ends in a posteriorly directed point. In *C. nidicola* the posterior arm of sternite IX is short and broad and does not equal sternite VIII. It terminates with the apex turned dorsally in a short hook. The posterior arms of sternite VIII are shorter in *C. nidicola* than in *C. stanfordi* but, like *C. stanfordi*, are ornamented with two rows of pale spinelets and a row of fine setae.

There are no conspicuous differences in the modified segments or receptaculi of the females of the two species.

The general characters as the shape of the head, number of pronotal spines, number and arrangement of apical spinelets on abdominal tergites, and the conspicuous long bristles on segments I and II of the hind tarsus appear much the same in both species. The eye is distinctly less pigmented in *C. nidicola* and the labial palpi have 8 or more segments in contrast to 5 or 6 in *C. stanfordi*.

The following specimens collected about 6 miles north of Lawrence, Kansas, from the nests of wood rats, *Neotoma floridana*, constitute the type series. Holotype male and allotype female, 64 paratype males and 92 paratype females collected November 11, 1944. Thirty-five paratype males and 41 paratype females collected March 1945. Types are deposited in the collection of the Rocky Mountain Laboratory. Paratypes are deposited in the

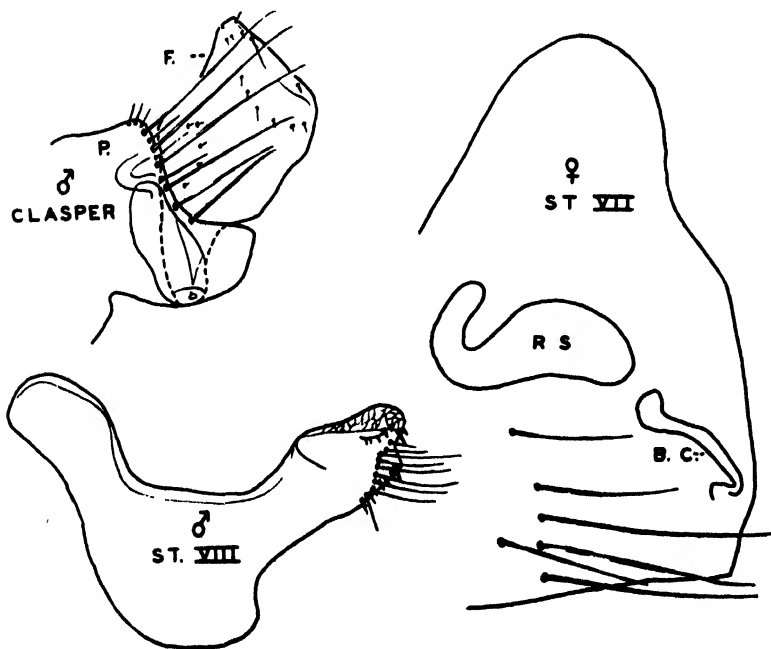
¹ From the Rocky Mountain Laboratory (Hamilton, Mont.), National Institute of Health.

Snow Collections, University of Kansas, and in the United States National Museum.

A male and a female collected from *Peromyscus* sp. at Cache Co., Oklahoma, February 5, 1941, by Fred McMurray are also of this species.

The writer has specimens of *C. stanfordi* from *Glaucomys volans*, Ithaca, New York, one male, collected by Robert Traub, and from *Glaucomys volans*, Ingham County, Michigan, December 1940, 4 males and 3 females, collected by Miss Lauzun.

The few collection records that have been published indicate that *C. stanfordi* is a parasite of various arboreal squirrels in the genera *Glaucomys*, *Sciurus*, and *Tamiasciurus* all of the family Sciuridae, while the species here described seems to be a parasite of *Neotoma* and *Peromyscus* of the family Cricetidae. There are several other genera of fleas in North America of which one or more species are characteristic of tree squirrels and one or more species are characteristic of deer mice, *Peromyscus*, or wood rats, *Neotoma*, both of which are in the family Cricetidae. These genera are *Monopsyllus*, *Opisodasys*, and *Orchopeas*. Discovery of *C. nidicola* in the nests of *Neotoma* and on *Peromyscus* adds another genus of fleas to those known to be shared by tree squirrels and Cricetidae in North America.



C NIDICOLA

References

- (1) Stewart, M. A.: New Nearctic Siphonaptera. Canadian Entomologist 62: 175-180 (1930).
- (2) Jordan, K.: On some North American Siphonaptera. Novitates Zoologicae 40: 262-271 (1937).
- (3) Ewing, H. E. and Fox, I.: The fleas of North America. U.S. Dept. Agric., Misc. Pub. No. 500. 1-142 (1943).

NOTES ON KANSAS BUTTERFLIES

DON B. STALLINGS and J. R. TURNER

Caldwell, Kansas

Hesperia attalus (Edwards). Previously this species has been represented in Kansas check-lists by a single specimen caught in Montgomery County, Kansas. During the season of 1944 we took a small series of this species (which appear to be typical) in Sumner County, Kansas. The first brood appeared June 4 and was in flight till June 18. The second brood was in flight from August 31 till Sept. 10. This species would appear to be native in Kansas, although rare.

Atlides halesus estesi (Clench). A single specimen of this race was taken in Sumner County on June 15, 1944. It was caught in association with **Strymon alcestitis**. This has not been recorded from Kansas previously and, for the time, must be considered a stray.

Strymon azia (Hew.). In a previous issue (Vol. XVII, p. 79, 1944) we reported the taking of a single specimen of **Strymon leda** (Edw.) captured in Sumner County, Kansas, June 3, 1943. A more careful study of this ragged specimen shows that it is **Strymon azia** rather than **leda**. Check lists should be corrected accordingly.

Hemiargus isola (Reak.). Reakirt described **isola** from specimens taken near Vera Cruz, Mexico. Later Edwards described **alce** from specimens taken in Colorado. Until recently **alce** has been treated as a synonym of **isola**. Field suggested that **alce** had racial value and used the name **alce** for the **isola** specimens occurring in the United States and northern Mexico. He distinguished the two as follows: "In typical **isola** the ground color of the under-surfaces is a dark grey while in **alce** this color is brownish grey, sometimes almost white. The palpi, underside of thorax and abdomen in **alce** are white, in **isola** grey." We consider this a good basis of separating **isola** from **alce** but we are unable to find any racial value in these differences, rather only a seasonal difference. We consider **alce** to be the summer form of **isola**. We have specimens of **alce** from, Kansas, Colorado, and through the Southwest into Mexico as far south as Vera Cruz. On the other hand we have good specimens of **isola** from Kansas (Oct. 29, 1944) and Colorado (Aug. 16, 1942, Beulah, Colo., Elevation 7500'). In extreme specimens of **isola** the under-surfaces are very dark and almost immaculate. The upper-surfaces of the females show more bluish and the males have a much darker bluish color on the upper-surfaces.

A LIST OF BUTTERFLIES (RHOPALOCERA) COLLECTED IN COWLEY COUNTY IN 1944

DELBERT WENIGER
Winfield, Kansas*

Upon investigation of the records of butterflies and their distribution in Kansas, it was found that only two species have been reported as occurring in Cowley County. These, as cited by Field (1938), are *Vanessa atalanta* and *Colias philodice*. Extensive studies have been made in other counties of Kansas. Field¹ (1938) says that "almost complete records are available on species occurring in . . . Scott, Harper, Sedgwick, Crawford, Douglas, Sumner, Greenwood and Riley counties." A majority of the other counties of the state have more or less complete records. He makes a plea for "local lists of butterflies taken anywhere in Kansas."

At the beginning of the 1944 season, therefore, the writer entered upon the project of preparing a list of the Rhopalocera found to be flying in Cowley County during that season. Of necessity the study had to be limited to a single season.

In order to gain as great completeness as possible almost daily trips were made to likely spots for flying butterflies. Alfalfa fields were the chief collecting places. More particular search had to be made for some species, however. Several, including some skippers, were found only where a hedge ran along the edge of an alfalfa patch. An alfalfa field within a few hundred feet of the Walnut River and bordered by dense thickets always yielded several species not seen elsewhere. One species was observed only in the back-yards of Winfield; another only in the heavy timber along the Walnut River.

At least one specimen of each species reported here was taken and the identification was made from the mounted specimen. At least one representative of each species has been placed in the permanent collection of the author.

An attempt has been made to keep records of the dates upon which particular species have been seen throughout the season in order to record something of the adult butterfly activity in the county. It seems that the only efforts made to record such dates in Kansas have been those of Randolph² (1929), Field (1938), and occasional notes on individual species since then. When enough of these are available it will be possible to make seasonal schedules for their activity. In the present paper, each species was taken and reported on the first day seen. It is regretted that this project was not started until the first of June; therefore species taken near the first of June might have been flying earlier. There is also a probability that some

* Contribution from the Department of Biology, Southwestern College, Winfield, Kansas.

¹ A Manual of the Butterflies and Skippers of Kansas. Bul. 12, Dept. of Entomology, University of Kansas, May 15, 1928.

² A Calendar of Kansas Butterflies, Entomological News, Vol. 40, pp 88-92, 1929.

very early-flying species were missed altogether. For any species that was seen more than once, the date of its last appearance is given.

Except for commonly distributed forms, an effort has been made to correlate the finding of each species in Cowley County with the previously known occurrences of that species. In some cases, this record means an extension of the range. Records cited are those accepted by Field (1938) unless stated otherwise.

The classification and nomenclature of Field (1938) is followed in the listing of the species in this paper.

I wish to thank Dr. Charles E. Burt, of the Biology Department, Southwestern College, for his encouraging help and suggestions. I also wish to thank Mr. Don B. Stallings, of Caldwell, for checking the determinations of certain species.

1. *Minois alope olympus* (Edwards).

The dark form of this butterfly was secured on July 7. Another was seen and taken on July 11.

The light phase with the light ochrous area around the ocelli of the forewing was taken on July 6. This form was very common throughout the summer until the end of August and was seen occasionally as late as Oct. 5.

2. *Polygonia interrogationis* (Fabricius).

Two specimens of the typical *interrogationis* were taken on June 6. It was abundant until the third week of August when it disappeared for the season.

The form *fabricii* was taken on September 15, and was seen occasionally until October 22.

3. *Nymphalis antiopa creta* Verity.

A single specimen of this subspecies was taken on September 15. Another was seen on October 22.

4. *Vanessa atalanta italica* Stichel.

This butterfly was taken on June 14 and was observed from then until the middle of August rather commonly. After that only two were seen, one on September 20 and the other on October 24.

This is one of the two species previously reported from Cowley County.

5. *Vanessa virginiensis* (Drury).

Both a male and a female of this butterfly were taken on June 15. The species was commonly found until the first of September.

6. *Vanessa cardui carduelis* Cramer.

This butterfly was taken on June 14. It was common until November 20.

7. *Precis coenia* (Hubner).

Two specimens were netted on June 6 and the butterfly was seen until November 10. On Nov. 10, the form *rosa* was taken.

8. *Basilarchia archippus* (Cramer).

A specimen was taken on July 11. The butterfly was seen occasionally on the wing until September 26.

9. *Asterocampa celtis* (Boisduval & LeConte).

Both a male and a female were taken in Cowley County on June 6. The species was common until October 5.

Asterocampa celtis montis (Edwards).

A male specimen of this subspecies was captured on July 7. It was the only one seen during the season, but it was a perfect specimen, plainly *montis*. The identification was kindly checked by Don B. Stallings.

This subspecies is listed by Field (1938) as "Having been recorded in Kansas from wind-blown specimens or strays that are far out of their normal range." He gives its range as "inhabiting the Rocky Mountains." The only previous Kansas record of the subspecies is from Scott County in the western part of the State. Its occurrence in Cowley County thus extends the range about 200 miles to the east. It is my opinion that while rare in Central and Eastern Kansas it is a resident in these localities. This specimen was no wind-blown individual, but was fresh and perfect. Furthermore, in 1942, while I was collecting in Kingman County, I took three perfect specimens of *montis*, including both male and female, which I still have in my collection. I believe that through close observation *montis* will be found over much of the State. It is perhaps often overlooked because it cannot be distinguished from typical *celtis* unless caught and examined.

10. *Anaea andria* Scudder.

A male specimen of typical *andria* was taken on July 7. The butterfly was not seen again until the last of July, when it became quite common until November 9, its last occurrence. During August those taken were form *andriaesta*.

11. *Anthanassa texana* Edwards.

This butterfly was taken on June 20. It was once again seen on July 10. After that it was rarely seen until the last of July when it became quite common. The last listing is November 9.

The species seems not to be common anywhere in Kansas except in the area of Harper, Sumner and Cowley Counties. While it also is recorded in Douglas County it was only from two specimens taken in 1929. Far to the west and north in Scott County it is reported to occur late in the fall. None of the counties in the southeast report it except Greenwood. It is, however, one of the commonest butterflies in the back-yards of Winfield in August and September, but, strange to say, it is not found outside the city.

12. *Phyciodes gorgone* (Hubner).

This butterfly was taken on June 14. While Field (1938) says that it is very common in Eastern Kansas, this was the only specimen located in Cowley County all season.

13. *Phyciodes nycteis* (Doubleday & Hewitson).

This butterfly was taken only on July 21.

The species is not common in Kansas, being recorded from only 9 counties. Of these 9 counties, 7 are in the very eastern section of the State, from Leavenworth and Riley in the North to Crawford, Labette and Greenwood in the Southeast. West of this area it has not been recorded previously at all in the south part of Kansas and in the north only in Wallace and Scott Counties. There is thus a wide area through central and southwest Kansas where it has not been taken. This Cowley County report extends its range west and south into this area.

14. *Phyciodes phaon* (Edwards).

A single specimen of the typical *phaon* was taken on July 1. The identification of this butterfly as *phaon* was checked by Don B. Stallings. It was the only specimen of this species taken during the year.

The species has been taken before in Douglas, Greenwood and Sumner Counties. It seems to be far from common in Kansas.

15. *Phyciodes tharos* (Drury).

This butterfly was taken on June 8. The species became rather common during the latter part of June and remained so until November 6 when it was last seen.

16. *Phyciodes vesta* Edwards.

A single perfect specimen was taken on June 16. Its identification was checked by Don B. Stallings.

It is evidently a very rare species here and in all of Kansas. It has been reported from only Harper, Scott and Riley Counties previously.

17. *Euptoieta claudia* (Cramer).

This species was taken on June 6. Thereafter it was extremely abundant all through the season until it disappeared on October 31. It is a close contender for the place as Cowley County's most common butterfly.

Dr. Field (1938) describes an aberration of this species called *albaclaudia* as having a whitish-brown ground color in place of the usual orange-brown. The only record of the aberration in Kansas is that of Don B. Stallings (1941) who reported the taking of eight specimens in Sumner County in 1940.

On June 16, 1944, a butterfly of the species was taken in Cowley County which appeared at first sight to be a badly wind-blown and faded specimen. However it was noticed that the wings were perfect and lacked the frayed edges usually found on a specimen which has encountered such hardships

as to fade it so appreciably. I could not detect damage or find any peculiarity other than color. Yet its ground color was almost white, shading into buff in the darker regions. A microscopic examination was made to see whether there had been such a great loss of scales as to result in the light color. The wings showed no more effect of brushing and damage than the wings of a typically colored specimen. The series of this aberration taken by Don B. Stallings has been studied and in comparison it was found that this specimen is decidedly lighter than any of those. It is the writer's opinion that this is really a specimen of the color variety, *albaclaudia*.

18. *Dione vanillae incarnata* Riley.

This rare Kansas butterfly was taken on June 14 and again on June 21. It was not seen again.

It is reported from nine counties, all except Scott County being in the Eastern half of the State. It has been taken in the area around Cowley County and so was expected here. The surprising thing was the date of its appearance. It is on the wing in Crawford County from the first of August until the 15th of September. Here it occurred only in June.

19. *Danaus plexippus* (Linnaeus).

This common butterfly was taken on June 7 and was seen until November 5.

20. *Libythea bachmanii* Kirtland.

This butterfly was taken on July 7 and was seen until about the third week in July. After that only two specimens were observed and the date was September 12. It was never common.

21. *Strymon melinus* (Hubner).

This butterfly was taken on June 6. It was common through all the season as late as October 22.

22. *Lycaena (Tharsalea) thoe* (Guerin).

A single specimen of this butterfly was seen and taken on July 18.

It is a rare butterfly in Kansas. It has been reported from 5 counties previously, but not before from this part of the State. Field's (1938) listing from Sumner is an error.

23. *Leptotes marina* (Reakirt).

A single specimen of this butterfly was taken on August 14. Another was secured on September 16 and a third on September 21. They were all reakirte Field, the female form.

The species has been taken before in 6 Kansas counties. It has been found in Harper, Sumner and Greenwood Counties in this area.

24. *Hemiargus isola alce* Edwards.

A specimen was taken on June 6 and another on July 12. After that date it became rather common until about October 11.

It has not been reported from the counties directly east of Cowley.

25. *Everes comyntas* (Godart).

A specimen of the spring form of this butterfly which is called *meinersi* Field, was taken on June 6.

On July 10 the typical *comyntas* was taken. This form was common until September 26.

26. *Colias philodice* Godart.

On June 14 a specimen of the typical *eurytheme* Boisduval was taken.

On August 17 the form *philodice* was netted.

On June 14 the white female form *alba* Strecker was obtained.

The species was seen until November 14 of that season. This is the second species formerly reported from Cowley County.

27. *Colias* (Zerene) *caesonia* Stoll.

The typical summer form *caesonia* was taken on June 21. During that week at least four were seen on the wing and then no more were observed.

28. *Phoebis sennae eubule* (Linnaeus).

Both a male and a female were taken on September 18. This was the earliest date on which it was seen here. Several more were seen during that week and the last for the year was observed on October 31.

29. *Eurema mexicana* (Boisduval).

A single perfect specimen of this butterfly was taken on July 11. The species was not seen again until October 17, when another was taken. From that time until November 10 it was occasionally seen.

The species has been reported from only 8 counties of Kansas previously. Only Sumner and Harper have before reported it in the south-central area.

30. *Eurema nicippe* (Cramer).

Two specimens were taken on June 14. The species was seen occasionally until the second week of July when it disappeared for the year.

31. *Eurema lisa* (Boisduval & LeConte).

Two specimens were taken on June 11. It was seen until October 31. On June 11 a specimen of the white female form *alba* was taken.

32. *Nathalis iole* Boisduval.

This butterfly was first taken on June 16. It was seen occasionally after that until the middle of July. Then it became very common. It was last seen on November 10.

33. *Pieris protodice* Boisduval & LeConte.

A specimen of the spring form of this species, *vernalis* Edwards was taken in Cowley County on June 14.

The common typical *protodice* was taken on July 11 and was last seen on October 24.

34. *Pieris rapae* (Linnaeus).

This butterfly was taken on June 14. It became rather common and remained so until its last appearance on October 25.

35. *Papilio ajax* Linnaeus.

A specimen of the typical form was taken on July 10. The species was fairly common through July and until last seen on November 14.

36. *Papilio glaucus* Linnaeus.

Two specimens of the dark female form were taken on July 18, a male specimen on July 24. The species was seen as late as September 12.

37. *Epargyreus clarus* (Cramer).

This butterfly was taken on June 5. It was rather common until the middle of July, after which it was seen no more until the first of September. By September 7 it was more common than it had been earlier. It was last seen on September 16. It is suggested that two broods must have been produced during the season.

38. *Pyrgus communis* (Grote).

This butterfly was taken on June 6 and was common until November 10.

39. *Pholisora catullus* (Fabricius).

This small black skipper was first taken on July 21 and from that date on it was one of the most common skippers until September 16.

This appears to be a very common species in western Kansas, but it has not been reported from any of the counties directly east of Cowley. This record from Cowley County is therefore an advance of the range toward the southeast.

40. *Pholisora hayhurstii* (Edwards).

This butterfly was taken on July 24. For about four weeks thereafter the species was occasionally seen in flight. It was not observed later except for a single specimen taken on September 16.

The species is far from common in Kansas, being previously reported from only 6 counties. These are Rooks, Osborne, Riley and Douglas Counties across the Northern part of Kansas; Sumner County just west of Cowley and Greenwood County northeast of Cowley. Like the preceding species, this one has not been taken in the southeastern corner of the state. Here again the record is a new advance of the range toward the southeast.

41. *Erynnis horatius* (Scudder & Burgess).

This butterfly was taken in Cowley county on August 14 and it was occasionally seen on the wing until September 18. The identification of the species was checked by Don B. Stallings. It is rather rare in Kansas. It has been recorded from Scott, Riley, Sumner, Greenwood and Douglas Counties previously. Thus, again, Cowley County is a new record for southeastern Kansas.

42. *Hylephila phylaeus* (Drury).

Two specimens were taken on August 14; another on September 18.

The butterfly is rather rare in Kansas, having been reported from Scott, Sumner, Greenwood, Riley and Douglas Counties only. Once again the same extension into the southeastern area is made by this record.

43. *Atalopedes campestris* (Boisduval).

This butterfly was first taken on June 6. It was seen until November 10, being perhaps the most common skipper here this season.

44. *Polites themistocles* (Latreille).

A single specimen was taken on June 6. It was not seen again until August 29, when two perfect specimens were netted. From then on until September 26 it was rather common.

45. *Atrytone logan* (Edwards).

This butterfly was taken first on August 9; again on August 29; and finally on September 16. It was rare. The identification was checked by Don B. Stallings.

The species is apparently rare in Kansas. It has been reported only from Clark, Pratt, and Reno Counties in the south-central area and from Greenwood and Douglas in the east. It has not been reported from any of the counties about Cowley County or in the southeastern corner of the State.

46. *Atrytone ruricola* (Boisduval).

A single specimen of this butterfly was taken on June 5. It was not seen again.

It has been reported previously only from Pottawatomie, Sumner, Greenwood and Douglas Counties.

47. *Ambyscirtes nysa* Edwards.

Two specimens were taken on August 10. This identification was checked by Don B. Stallings.

48. *Lerodea eufala* (Edwards).

A single specimen of this butterfly was taken on September 12. Its identification was checked by Don B. Stallings.

The species has been reported previously from Scott, Sumner, Greenwood, Harper, and Douglas Counties. This Cowley County record is therefore a southeastern advance of the range.

1945 Additions

The foregoing records of the 1944 season are incomplete because of the fact that observations were not begun until June 1. In 1945, catching and recording was begun with the first butterfly seen. The following list, therefore, supplements the preceding list and gives the dates of the first appearance of the species flying earlier than June 1.

1. *Polygonia interrogationis fabricii* Edwards, March 20.
2. *Nymphalis antiopa creta* Verity, March 15.
3. *Vanessa atalanta italica* Stichel, March 16.
4. *Vanessa cardui* (Linnaeus), March 20.
5. *Anaea andria* Scudder, March 17.
6. *Phyciodes tharos marcia* Edwards, April 20.
7. *Euptoieta claudia* (Cramer), March 26.
8. *Danaus plexippus* (Linnaeus), April 11.
9. *Everes comyntas meinersi* Field, May 7.
10. *Colias philodice ariadne* Edwards, March 31.
11. *Pieris rapae* (Linnaeus), March 20.
 form *immaculata*, April 2.
12. *Papilio glaucus* Linnaeus, April 9.
13. *Epargyreus clarus* (Cramer), April 11.
14. *Pyrgus communis* (Grote), May 4.
15. *Pholisora catullus* (Fabricius), May 6.

In addition, two species which have not before been reported from Cowley County were taken in 1945.

1. *Lycaenopsis argiolus* (Linnaeus).

Form *neglecta* of this species was taken in Cowley County on March 28. It was not seen again.

2. *Euchloe olympia rosa* Edwards.

Two specimens of this species were netted in Cowley County on March 31. It was not observed again.

PRICE OF BACK VOLUMES

Back Volumes \$2.00 per volume

Subscriptions for back volumes or numbers should be sent to Donald A. Wilbur, Department of Entomology, Kansas State College, Manhattan, Kansas.

CONTENTS OF THIS NUMBER

The Fourteenth or 1944 Annual Insect Population Summary of Kansas.

GEO. A. DEAN, ROGER C. SMITH and E. G. KELLY 85

The Genus *Kelisia* in America North of Mexico (Homoptera - Fulgoridae - Delphacinae).

R. H. BEAMER 100

Siphonaptera: A New Species of *Conorhinopsylla* from Kansas.

WILLIAM L. JELLISON 109

Notes on Kansas Butterflies.

DON B. STALLINGS and J. R. TURNER 111

A List of Butterflies (Rhopalocera) Collected in Cowley County in 1944.

DELBERT WENIGER 112

Journal of the Kansas Entomological Society

Volume 18

October, 1945

Number 4

PUBLICATION COMMITTEE

PAUL B. LAWSON, Editor, Lawrence
R. H. BEAMER, Lawrence **R. H. PAINTER**, Manhattan
DWIGHT ISELY, Fayetteville, Ark.



JAMES WALKER McCULLOCH
1889-1929

Entered as second-class matter June 7, 1939 at the Post Office at
Manhattan, Kansas, under the Act of August 24, 1912.

JOURNAL OF THE KANSAS ENTOMOLOGICAL SOCIETY

A quarterly journal published in January, April, July and October devoted to Entomology in the Western Mississippi Basin and the proceedings of the Kansas Entomological Society.

Manuscripts for publication may be sent to any of the publication committee.

The Kansas Entomological Society does not make exchanges since the Society does not maintain a library.

Subscription to the Journal must be paid in advance. The subscription rate is so low that second notices are not ordinarily sent out.

Payment of Canadian or other foreign subscriptions and bills must be made by international Postal Money Order or by a draft on a New York bank and payable in U.S.A. dollars.

Subscribers are urged to give us their full cooperation in these matters.

Subscriptions should be sent to Donald A. Wilbur, Department of Entomology, Kansas State College, Manhattan, Kansas.

Subscriptions in the U.S.A.,	\$2.00 per year	Single Copy
Canadian or foreign subscriptions,	2.25 per year	60 cents

KANSAS ENTOMOLOGICAL SOCIETY

President, H. H. Walkden, Hutchinson, Kansas

Vice-president, Paul B. Lawson, Lawrence, Kansas

Secretary-Treasurer, Donald A. Wilbur, Manhattan, Kansas

Vol. 18, No. 4, October, 1945

This issue mailed October 29

**MANSONIA INDUBITANS DYAR AND SHANNON—A NEW
MOSQUITO ADDITION TO THE UNITED STATES FAUNA**

HARRY D. PRATT, P.A. Sanitarian (R)
U.S. Public Health Service, San Juan, Puerto Rico

Mansonia indubitans Dyar and Shannon was originally described (3) in 1925 from females collected in several localities in central Brazil and later from males and females from central Brazil and Iquitos, Peru, by Shannon (5). Tulloch (6) first described the larvae and pupae from specimens found attached to the roots of **Pistia Stratiotes** Linnaeus in Lake Cartagena, Puerto Rico, on November 16 and 22, 1935. He was able to rear an adult male which is now in the United States National Museum.

Since that time males and females have been found by the writer in light trap collections at Fort Buchanan and Camp Tortuguero, P. R., chiefly in the winter months. The maximum collection contained 3 males and 36 females and was made on the night of November 29, 1942 at Fort Buchanan, P. R.

In 1943, 1944, and 1945 adult females were collected in light traps in South Clarendon Parish, Jamaica, B. W. I., by C. E. Peres, A. E. Pritchard, G. A. Thompson, and the writer. On January 17, 1945, G. A. Thompson and H. D. Pratt also collected larvae and pupae attached to the roots of **Pistia** in this same locality.

D. G. Denning, and W. W. Wirth of the U. S. Public Health Service collected larvae, pupae and reared adults from the roots of **Pistia Stratiotes** Linnaeus in Boca Raton, Florida, August 16, 1944. These specimens sent to the writer are the first definitely identified specimens of **Mansonia indubitans** Dyar and Shannon known to occur naturally in the United States.

The larvae and pupae of **Mansonia flaveolus** (Coquillett) illustrated and mentioned in the keys were collected at Carolina, P. R., September 19, 1943 on the roots of water spoon (**Hydromystria stolonifera** G. F. W. Meyer.)

As pointed out by Shannon (5), the adults of **Mansonia indubitans** Dyar and Shannon and **Mansonia titillans** (Walker) are very similar. The characters of length of female palpi and male genitalia used by Shannon appear to be valid, but are so slight as to make these determinations difficult. On the other hand perfectly good characters do exist for the separation of females using characters of female terminalia or, more specifically, of the arrangement of spines on the eighth tergite.

The genus **Mansonia** Blanchard is composed of four subgenera according to Edwards (4). In two of these subgenera: **Coquillettidia** Dyar and **Rhyn-**

chotaenia Brethes there are no spines on the eighth tergite and separation of the species on the basis of female terminalia is difficult. In the other two subgenera: *Mansonia* Blanchard and *Mansonioides* Theobald the eighth tergite is armed with sharp, heavily sclerotized hooks or spines which have a characteristic arrangement for each species. The arrangement of the spines has been shown for species in the Oriental subgenus *Mansonioides* by a number of workers including Barraud (1). The arrangement of spines on the eighth tergite for three Caribbean species: *flaveolus* (Coquillett), *indubitans* Dyar and Shannon, and *titillans* (Walker) is shown in figures 4, 5, and 6. The three species may be separated by the following key:

Key to Females using Characters of Eighth Tergite

1. Eighth tergite without a group of closely set spines in middle of posterior margin, spines separated by at least their own diameter, and arranged more or less in two irregular rows, fig. 6 *indubitans* Dyar and Shannon
- Eighth tergite with a group of six to nine closely set spines in middle of posterior margin 2
2. Six spines set closely to one another in middle of posterior margin of eighth tergite, fig. 4 *flaveolus* (Coquillett)
- Seven to nine spines set closely to one another in middle of posterior margin of eighth tergite, fig. 5 *titillans* (Walker)

The arrangement of the spines figured in *indubitans* (fig. 6) has been checked with a slide mount of the paratype from Rio Branco, Brazil, made for the writer by Alan Stone, U. S. National Museum. Specimens from Florida, Jamaica, and Puerto Rico show no intergradation between *indubitans* and *titillans*, although intergrades between *titillans* and *flaveolus* will probably be found by later workers. *Flaveolus* and *titillans*, however, are easily separated by other adult characters such as color and length of palpi.

Adult females of these three species may be separated by the following key adapted from Shannon (5):

Key to Adult Females

1. Abdomen covered entirely with bright golden scales; mesonotum generally yellowish brown, clothed with golden scales and isolated patches of dark scales; palpi of female exceeding one-half the length of the proboscis, fig. 1 *flaveolus* (Coquillett)
- Abdomen mostly dark scaled; palpi of the female less than one-half the length of the proboscis 2
2. Palpi about one-fourth the length of the proboscis; small species, 3-4 mm. long, fig. 3 *indubitans* Dyar and Shannon
- Palpi about one-third the length of the proboscis; small to moderate in size, 5-6 mm. long, fig. 2 *titillans* (Walker)

Larvae of the three species may be separated from *Mansonia* (Coquillettia) *perturbans* (Walker) by the toothed maxillary spine, the anal segment being ringed by a sclerotic plate and pierced by 4 precratal hairs, and the two long hairs arising from the median notch in the antennal shaft extending to or beyond the tip.

Larvae of the three Caribbean species may be separated by the following key:

Key to Larvae

1. Comb scales on eighth abdominal segment broad, with numerous coarse denticles, fig. 10 **indubitans** Dyar and Shannon
 Comb scales on eighth abdominal segment narrow, with fine denticles 2
2. Precratal hairs piercing sclerotic ring surrounding anal segment single, **gamma** hair of pentad group on eighth segment single or double, hairs on air tube single, fig. 11 **flaveolus** (Coquillett)
 Precratal hairs piercing sclerotic ring surrounding anal segment double or multiple; **gamma** hair of pentad group on eighth abdominal segment double or multiple; hair on air tube double or multiple, fig. 12 **titillans** (Walker)

The pupae of *Mansonia* differ from those of all other New World mosquitoes in lacking the dendritic tuft on the first abdominal tergite, and in the tapered, pointed trumpet adapted to piercing the soft tissues of aquatic plants in order to obtain their air supply. The paddles have a peculiar notch on the inner margins and no apical paddle hair. The trumpet of *indubitans* specimens from Florida and Jamaica is longer than that of *flaveolus* specimens from Puerto Rico and Bonne Wepster's (2) figure of *titillans* from Dutch Guiana. A key to the pupae of *indubitans* and *flaveolus* is given below.

Key to Pupae

1. Pupal trumpet long and slender, at least five times as long as greatest diameter; abdominal hairs B and C on segments IV, V, VI and VII conspicuously developed; paddle slender, 3 times as long as greatest width, with strong marginal denticulation, fig. 14 **indubitans** Dyar and Shannon
 Pupal trumpet short and stout, about three times as long as greatest diameter; abdominal hairs B and C on segments IV, V, VI, and VII weak and poorly developed; paddle broad, twice as long as greatest width, with slight marginal denticulation, fig. 13 **flaveolus** (Coquillett)

At the present time *flaveolus* is known to occur in the Virgin Islands, Vieques, and Puerto Rico, Panama, and Brazil. All *titillans* records for the Virgin Islands, Vieques, and Puerto Rico probably should be referred to *flaveolus* on the basis of such characters as coloration, length of female palpi, and female genitalia. In Jamaica both *titillans* and *indubitans* are known to

occur. Shannon (5) has shown that many of the South American records of *titillans* refer either to species of *Psorophora* or to *M. indubitans*.

It is believed that some of the United States records of *Mansonia titillans* (Walker) reported in the literature actually are based on specimens of *Mansonia indubitans* Dyar and Shannon. It is hoped that a study of reared material will be made in the future and the specimens recorded in the literature will be re-examined to determine the distribution of these two easily confused species.

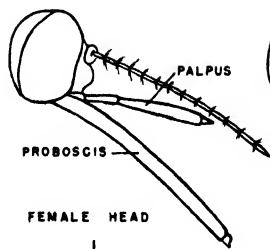
Acknowledgments

During the present study G. H. Bradley, Porter A. Stephens, and W. W. Wirth have made many helpful suggestions. The writer wishes to acknowledge also the assistance of A. E. Pritchard, C. E. Peres, D. G. Denning, in procuring specimens, and particularly of J. Maldonado Capriles and G. H. Thompson who helped with field work in Puerto Rico and Jamaica. Special acknowledgment is made herewith to Dr. Alan Stone of the U. S. National Museum for checking identification of specimens and for information regarding the types of *flaveolus* and *indubitans*.

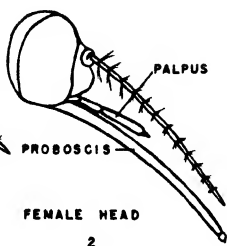
Literature Cited

1. Barraud, P. J., 1934, Fauna of British India, Vol 5, Diptera, Tribes Megarhinini and Culicini, pp 1-463. (*Mansonioides*, pp 123-131)
2. Bonne-Wepster, J and Bonne C., 1925, The Mosquitoes of Surinam, Roy. Col. Inst. Amst., Dept. Trop. Hyg., Med. N. 21, and Trop. Hyg. No. 13, pp 588, 83 figs.
3. Dyar, H. G. and Shannon, R. C., 1925, New Mosquitoes from Brazil, Jn. Wash. Acad. Sci., 15 (2): 39-41
4. Edwards, F. W., 1932, "Diptera, Family Culicidae," in P. Wytman, *Genera Insectorum*, fasc. 194, Bruxelles. V. Verteneuil and L. Desmet, pp 258, illus.
5. Shannon, R. C., 1934, The genus *Mansonia* in the Amazon Valley, Proc. Ent. Soc. Wash., 36: 99-110
6. Tulloch, G. S., 1937, The Mosquitoes of Puerto Rico, Journ. Agr. U. P. R., Rio Piedras, 21: 137-168.

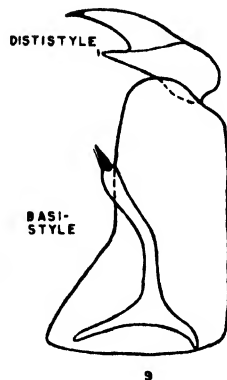
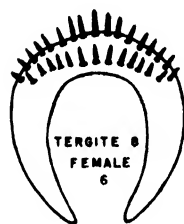
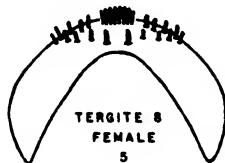
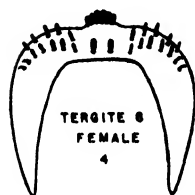
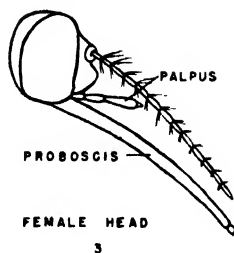
FLAVEOLUS

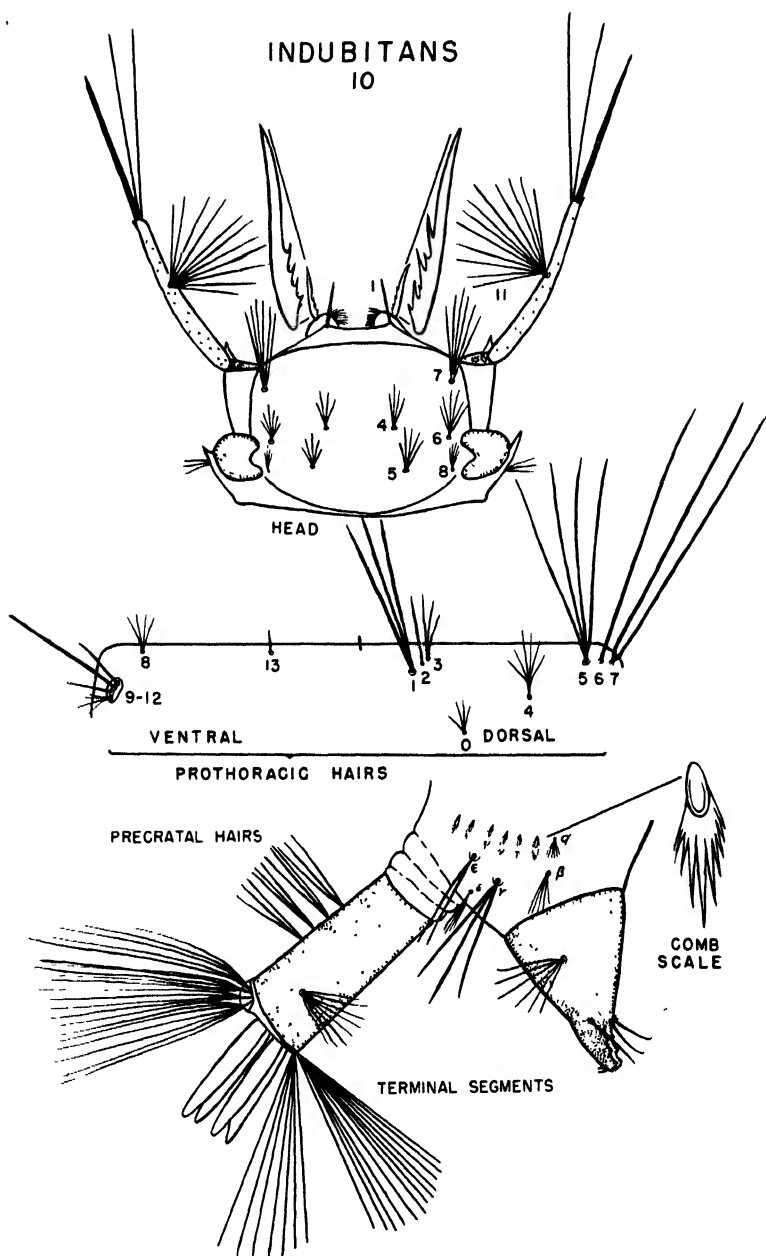


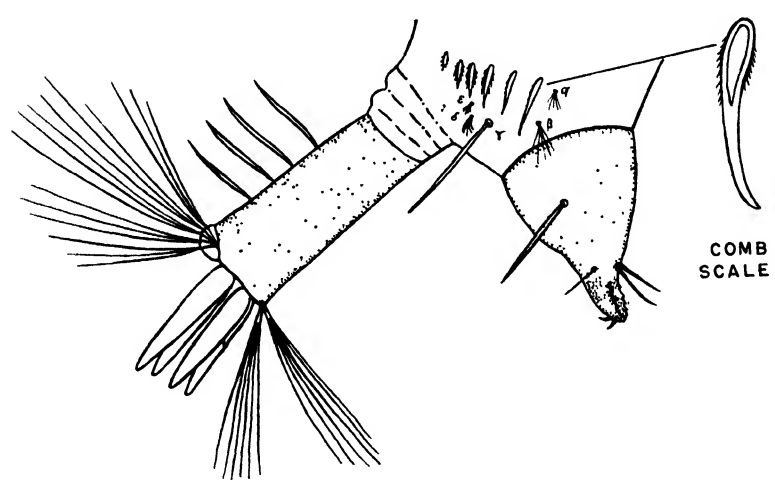
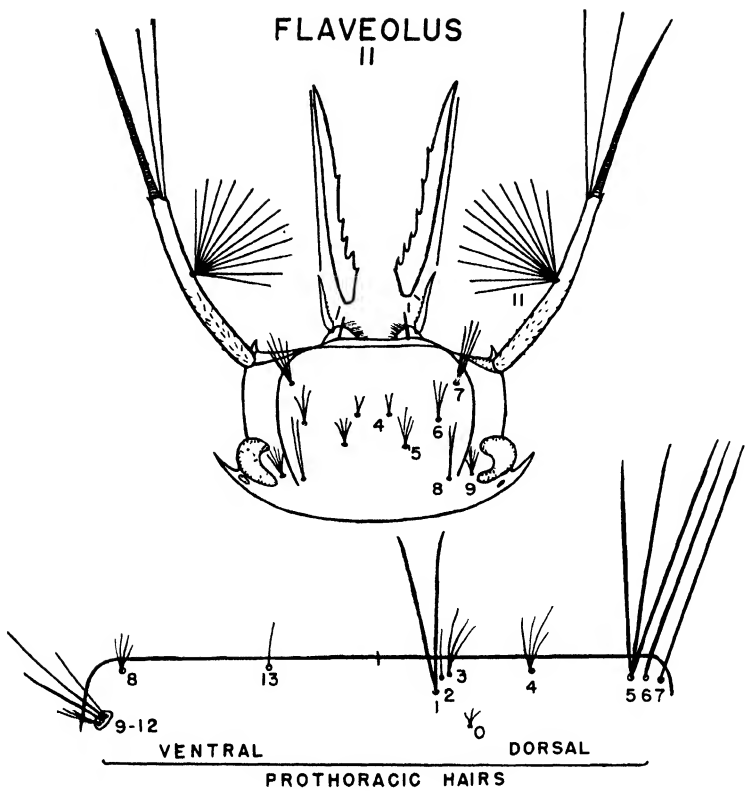
TITILLANS



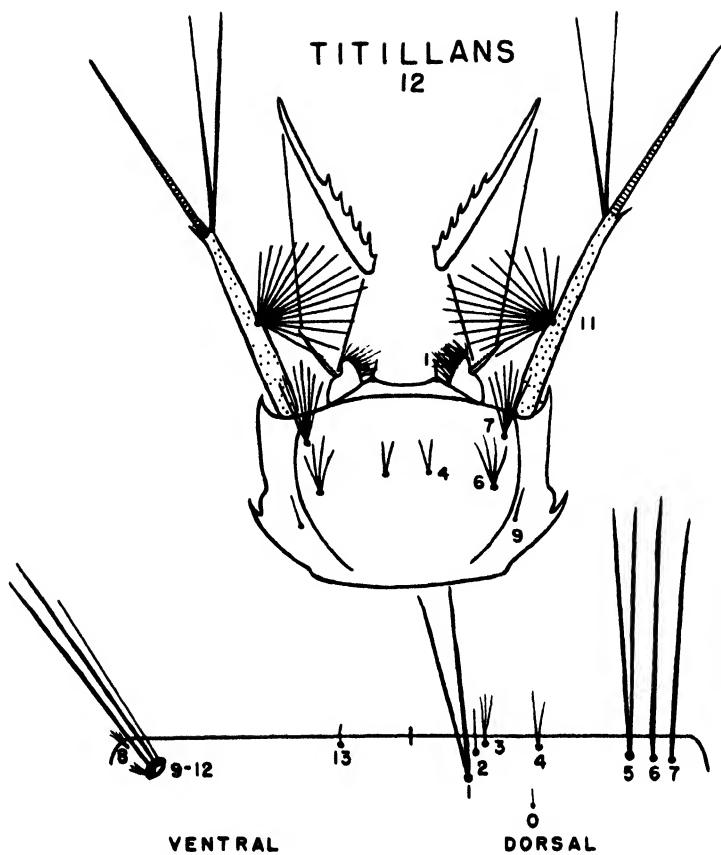
INDUBITANS



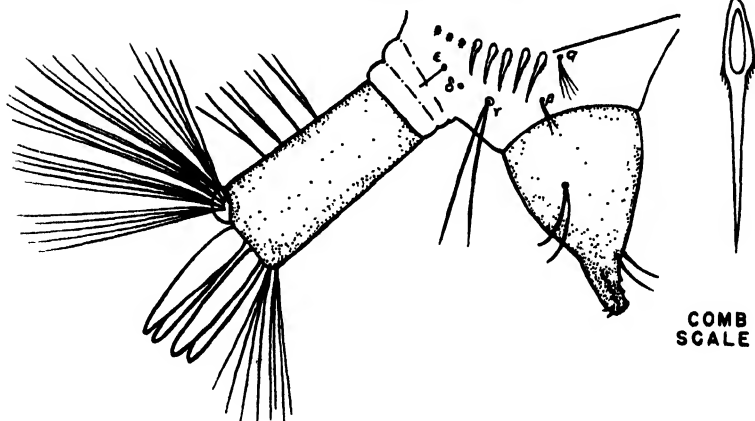


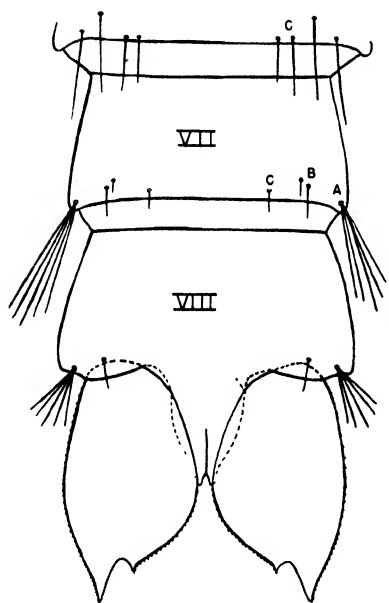
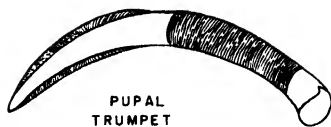
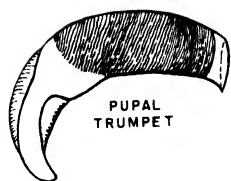


TITILLANS 12

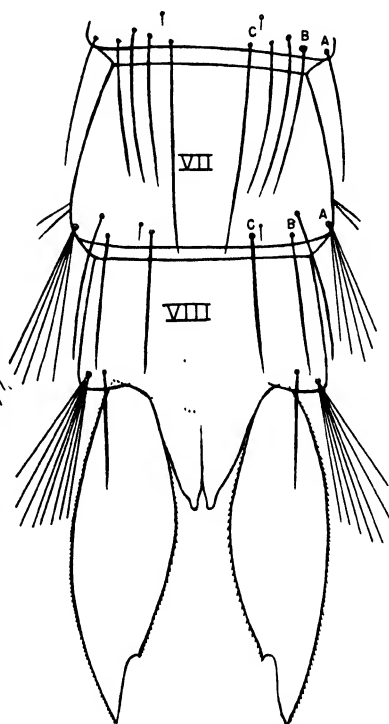


PROTHORACIC HAIRS





FLAVEOLUS
13



INDUBITANS
14

THE HESSIAN FLY RESISTANCE OF PAWNEE WHEAT¹REGINALD H. PAINTER and ELMER T. JONES²

The Pawnee variety of wheat was released to farmers in Nebraska in 1942 and to growers in Kansas and Oklahoma in 1943. In the fall of the latter year about 650 bushels of this wheat were planted in Kansas. This hard, red variety is recommended for planting in the eastern part of the hard-wheat belt. One reason for the release of this variety is that it exhibits considerable resistance to the hessian fly [*Phytophaga destructor* (Say)]. This paper is a report of the present status of this resistance and its possible importance in hessian fly control.

History of the variety.—Pawnee is a selection from the cross Kawvale x Tenmarq made in 1928 at the Kansas Agricultural Experiment Station primarily to combine the hessian fly resistance, leaf rust resistance, and desirable agronomic characters of Kawvale with the good bread-making and certain other characters of Tenmarq. Kawvale appeared to be the best available source of resistance to the hessian fly in varieties tested up to that time.

The first, second, and third generations of this cross were grown in Manhattan, Kans. Seed from a number of the third-generation plants was sent to Lincoln, Nebr., and the strain that was later named Pawnee was selected from the progeny of an F₃ plant in 1932. At the time of selection there was present in the Nebraska Agronomy Nursery a heavy natural infestation of the hessian fly (Kiesselbach et al., 1933; Suneson and Kiesselbach, 1934). The fly resistance of Pawnee at that time was partly responsible for bringing this strain to the attention of the agronomists. Since the choosing of the strain there has been little subsequent selection.

Review of literature.—Information concerning the characteristics of the parents of Pawnee, particularly with reference to hessian fly resistance, has been given in an earlier paper (Painter, et al., 1931). The history and characteristics of Pawnee have been given in several papers (Clark, 1943; Reitz and Laude, 1943; and Quisenberry and Kiesselbach, 1943). Data presented by Hollingsworth (1933) and subsequent investigations at the Kansas station indicate that resistance to the hessian fly tends to be dominant in Kawvale and its hybrids, but the number of factors involved is unknown.

Reitz and Laude (1943) reported that, in 42 station-years in Kansas, Pawnee showed an advantage in yield of 17 percent over Tenmarq, of 33 percent

¹ Contribution No. 535 of the Department of Entomology, Kansas Agricultural Experiment Station, Manhattan, Kans. Investigations conducted cooperatively by the Department of Entomology and the Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, U. S. Department of Agriculture.

² Associate entomologist, Kansas Agricultural Experiment Station, and associate entomologist, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, respectively. Thanks are due to members of the Department of Agronomy and Botany, Kansas Agricultural Experiment Station, and to H. C. Fryer, of the Department of Mathematics, for assistance in various phases of this investigation.

over Blackhull, and of 42 percent over Turkey. Keim (1943) reported a 30 percent excess over Turkey during 7 years of tests at Lincoln, Nebr. Most of the experiments reported in the papers just referred to were conducted in the absence of severe fly infestation, hence do not reflect the resistance of Pawnee to this insect.

Characteristics of Pawnee wheat.—Pawnee wheat has a unique combination of desirable characters. In addition to its innate yielding ability, Pawnee ordinarily has a higher test weight than its parents and many other hard, red winter wheats grown commercially. It is short, stiff-strawed and winter hardy, and matures early. As reported by Reitz and Laude (1943), Pawnee is practically immune to loose smut, resistant to some common forms of leaf and stem rust, and moderately resistant to stinking smut, or bunt. Pawnee is reported to have milling and baking qualities similar to those of Turkey wheat. Among the disadvantages of this variety may be mentioned its susceptibility to speckled leaf blotch (*Septoria*) and possibly greater susceptibility to green bug and chinch bug injury than that of Turkey wheat and some other common varieties. Thus, aside from its resistance to the hessian fly, Pawnee is a highly desirable wheat, with good inherent yielding capacity and possessing the best combination of wheat-pest resistance and other characteristics now available in a commercial winter wheat.

Data and methods of study.—The hessian fly resistance of Pawnee wheat has been studied along with that of other varieties and hybrids in special nurseries conducted by the Kansas Agricultural Experiment Station and the United States Bureau of Entomology and Plant Quarantine. Infestation was induced at Manhattan by bringing in infected stubble, as has been previously reported (Painter et al., 1931, 1940). Other tests have been conducted at Ramona and Bennington, Kans., and at Springfield, Mo., in areas of natural fly infestation. The accumulated records of hessian fly infestation in wheat varieties and hybrids from 1924 to 1943 at various localities in Kansas and Missouri are given in table 1. The infestation given in this table will indicate the position of Pawnee and its parents, Kawvale and Tenmarq, with reference to other commercially grown wheats, and also in contrast to hybrids involving Marquillo, which possess a higher degree of resistance in both the hard- and soft-wheat belts (Painter et al., 1940; Reitz et al., 1943; Jones, 1943).

During the last 3 years, in particular, records have been made of the infestation in cooperative wheat-variety tests conducted by the Kansas Department of Agronomy with farmers in many counties in Kansas. In these tests, in addition to information on fly infestation in a number of different parts of the State, it was possible to obtain data on the yield of Pawnee in comparison with Tenmarq under a considerable range of intensities of fly infestation.³ Yields from these cooperative tests were obtained from ten

³ The writers are indebted to A. L. Clapp and others of the Department of Agronomy, Kansas Agricultural Experiment Station, for the opportunity of collecting fly data at these tests and for information on subsequent yields.

1-rod lengths of a row of grain in drill rows scattered over a plot. Most of the plots were as wide as the drill and several hundred yards in length.

Table 1.—Accumulated records of hessian fly infestation in wheat varieties and hybrids, 1924-1943¹

Variety and record No	Station-year test	Average plants infested			Remarks
		Variety named	Tenmarq in same tests	Tenmarq in same test ²	
	Number	Percent	Percent	Percent	
Kawvale-Marquillo × Kawvale-Tenmarq C.I. 12331	12	3	90	3	
Marquillo × Tenmarq 37FN1507	31	6	69	9	One of the best simple Marquillo hybrids.
Kawvale C.I. 8180	33	19	61	31	In hard-wheat area.
Kawvale C.I. 8180	18	77	82	94	In soft-wheat area.
Kawvale C.I. 8180	51	40	68	59	In both areas.
Pawnee C.I. 11669	21	39	68	57	In hard-wheat area.
Pawnee C.I. 11669	13	84	86	98	In soft-wheat area.
Pawnee C.I. 11669	34	55	75	73	In both areas.
Blackhull C.I. 6251	14	52	68	76	Somewhat tolerant.
Early Blackhull C.I. 8856	21	59	69	86	Somewhat tolerant.
Wichita C.I. 11952; Ks. 2739	15	74	82	90	Somewhat tolerant.
Tenmarq	51	68	68	100	
Chiefkan C.I. 11754	19	81	79	102	Somewhat tolerant.
Comanche C.I. 11673	17	83	80	104	
Turkey C.I. 1558	11	76	70	109	

¹ Records from both hard- and soft-wheat areas, except as noted

² Percentage rating of variety named if Tenmarq were rated at 100

In nurseries, particularly at Manhattan, Kawvale and Tenmarq have been under test since 1924, and the other varieties for different lengths of time.

The differences in fly infestation of the same wheat varieties in various parts of Kansas have been discussed previously (Painter et al., 1931), and similar factors have an important bearing on the resistance of Pawnee, as will be pointed out in this paper.

Resistance of Pawnee as measured by percentages of plants infested.—On 19 occasions Pawnee has been tested on a comparable basis with its parents, Kawvale and Tenmarq. The results of these tests, together with those of some earlier tests involving only Kawvale and Tenmarq, are given in

table 2. To facilitate comparison of the data, the infestation of Pawnee and Kawvale is also reported as a percentage of Tenmarq in the same test. The infestation in Tenmarq in these tests ranged from 25 to 100 percent, with an average of 65 percent. Under the same conditions Pawnee ranged in infestation from 0 to 94 percent with an average of 39 percent, and Kawvale from 0 to 64 percent, with an average of 28 percent. It is evident that, in general,

Table 2.—Hessian fly infestation records of Kawvale, Tenmarq, and Pawnee in the same tests in central Kansas

Year and Test	Kawvale in terms of infestation of Tenmarq in the same test	Actual plants infested			Pawnee in terms of infestation of Tenmarq in the same test
		Kawvale	Tenmarq	Pawnee	
	Percent	Percent	Percent	Percent	Percent
1924 fall, Manhattan (drilled)	12	7	60	—	—
1927 fall, Manhattan (drilled)	0	0	85	—	—
1929 fall, Manhattan (drilled)	6	4	62	—	—
1931 fall, Manhattan (drilled)	5	4	74	—	—
1932 fall, Manhattan (drilled)	14	8	56	—	—
1933 fall, Manhattan (drilled)	0	0	37	0	0
1934 fall, Manhattan (drilled)	62	32	52	42	81
1936 fall, Manhattan (spaced)	24	9	38	12	32
1936 fall, Junction City (spaced)	35	26	74	58	78
1938 spring, Junction City (drilled)	40	10	25	13	52
1939 fall, Manhattan (spaced)	0	0	29	0	0
1940 spring, Ramona (spaced)	115	39	34	17	50
1940 fall, Manhattan (drilled)	63	48	76	42	55
1940 fall, Ramona (drilled)	60	46	77	38	49
1940 fall, Manhattan (spaced)	38	21	55	33	60
1940 fall, Ramona (spaced)	56	32	57	32	56
1941 spring, Manhattan (spaced)	66	64	97	73	75
1941 spring, Ramona (spaced)	52	44	84	48	57
1941 fall, Manhattan (drilled)	29	22	77	30	39
1941 fall, Bennington (drilled)	38	21	55	38	69
1942 spring, Manhattan (drilled)	26	24	92	56	61
1942 spring, Bennington (drilled)	40	40	100	94	94
1942 fall, Manhattan (drilled)	26	20	76	48	63
1942 fall, Bennington (drilled)	30	29	98	60	61
12 station-years, average of fall records	35	24	62	33	49
6 station-years, average of spring records	56	37	72	50	65
19 station-years, average of all records	42	28	65	39	54

Pawnee had about one-half as high an infestation as Tenmarq and that Kawvale had a somewhat lower infestation than Pawnee. These data were analyzed by analysis of variance using the arc-sine transformation (Snedecor, 1940). The results of the analysis are given in table 3. They indicate that the difference between Tenmarq and the other two varieties is highly significant, as is the difference between spring and fall infestation, the former being generally higher in all cases. The analysis also indicated that the fly resistance, as measured by the percentage of plants infested, is different in Pawnee and Kawvale; hence it seems that not quite all the fly resistance of Kawvale has been inherited by Pawnee. It is possible that some of the genes for fly resistance possessed by Kawvale are absent or heterozygous in Pawnee. This is especially probable in view of the fact that this variety was selected in the third filial generation and has had little subsequent selection. It is possible also that Pawnee carries some strains that are fairly susceptible to the fly. In 1943 a considerable number of head-row selections of Pawnee were studied, and two of these were discarded because they appeared to be more susceptible to the fly than was the parent variety.

Table 3.—Analysis of 19 station-years' experiments on Pawnee, Kawvale, and Tenmarq, 1933-43 (Arc-sine transformation)

Source of variation	Degrees of freedom	Sum of squares	Mean square	P less than
Between varieties	2	6,906.18	—	—
Tenmarq vs. others	1	6,454.56	6,454.56	0.001
Pawnee vs. Kawvale	1	451.61	451.61	0.020
Between experiments	18	—	—	—
Spring vs. fall	1	1,477.04	1,477.04	0.001
Experiments within seasons	17	11,024.15	648.48	0.001
Variety \times experiment ¹ (experimental error)	36	2,381.52	66.15	—
Total	56	21,788.88	—	—

¹ The variety \times season interaction was small and is included in experimental error

Fly resistance of Pawnee as measured by infestation of tillers.—The infestations of Pawnee and Tenmarq, as measured by both plant and tiller infestations in representative tests in various parts of Kansas, are given in table 4. The data here indicate that in general Pawnee has about one-fourth as high a tiller infestation as does Tenmarq. The lower infestations of both tillers and plants of Pawnee are primarily the results of the smaller numbers of larvae surviving from those that reach the normal feeding position (fig. 1). The tiller infestation in these two varieties reflects not only the resistance, as measured by plant infestation, but also the ability of Pawnee to grow more normally under fly infestation and to recover from the effects

of this infestation. This ability is spoken of as tolerance and is discussed later.

Geographical aspects of the fly resistance of Pawnee.—Pawnee and Kawvale have been grown and tested for fly resistance under various conditions and in a number of localities. In the soft-wheat area both varieties have shown little resistance, as measured by percentage of plants infested (table 1). In 18 tests in the soft-wheat area, mostly at Parsons, Kans., and Springfield, Mo., Kawvale had an average of 77 percent of the plants infested, while Tenmarq in the same test had 82 percent. In 13 tests in the same area Pawnee had 84 percent plant infestation as compared with 96 percent for Tenmarq. These results differ considerably from the results in the hard-wheat area of central Kansas, as recorded in tables 1 and 2 and discussed earlier in this paper.

Table 4.—Relation of tiller to plant infestation by the hessian fly in Pawnee and Tenmarq

Year and season	Pawnee		Tenmarq		Infestation in terms of Tenmarq infestation in the same test	
	Plants infested	Tillers infested	Plants infested	Tillers infested	Plants	Tillers
	Percent	Percent	Percent	Percent	Percent	Percent
1933 fall	0	0	37	8	0	0
1934 fall	42	20	59	31	71	65
1936 fall, Manhattan	12	2	38	8	32	25
1936 fall, Junction City	58	12	74	21	78	57
1942 spring, Dickinson County	20	7	60	33	33	21
1942 spring, McPherson County	28	8	68	29	41	28
1942 spring, Reno County	42	12	94	46	45	26
1942 spring, Ottawa County	12	2	72	20	17	10
1942 spring, Marshall County	8	1	84	28	10	4
1943 spring, McPherson County	48	8	100	57	48	14
1943 spring, Harvey County	94	28	100	47	94	60
Average					43	28

While Kawvale and Pawnee have been growing in cooperative and other tests in various parts of Kansas, records have been made of the infestation of these varieties and of Tenmarq in about 30 counties. These records are supported by casual observation of numerous fields of Kawvale and other varieties in the same areas. Most of the records have been obtained in the central counties, where it is expected that Pawnee will be grown most abundantly. The results of the studies, as measured by the infestation of Pawnee or Kawvale expressed in terms of infestation of Tenmarq, are given in the accompanying map (fig. 2). This gives a rough indication of the approximate area in which Pawnee shows its greatest resistance to the hessian fly.



Fig. 1—Comparison of number and size of larvae and puparia of the hessian fly removed from 10 plants of A, Pawnee wheat, and B, Tenmarq wheat.

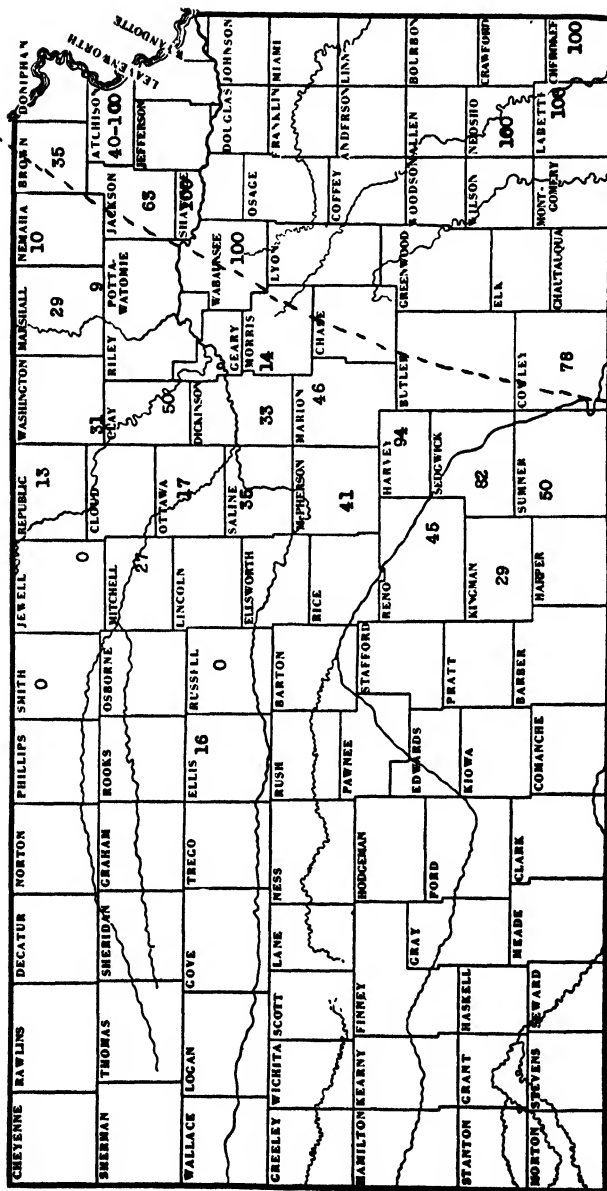


Fig. 2.—Infestations of Pawnee or Kawvale wheat in terms of percentage of infestation of Tenmarq in various counties in Kansas. The infestation tends to be lighter northwest of the broken line

The data indicate that Kawvale and Pawnee are generally more resistant northwest of a line drawn from Brown County to Cowley County. There is, however, variability within this area. For instance, in Clay County the cooperative tests were grown in an area and in a field where Kawvale has been grown commonly for several years. The infestation in the test in this county has been somewhat higher in Kawvale and Pawnee than would be expected from infestations in neighboring counties. The high infestation in Harvey and Sedgwick Counties occurred in 1943 in single tests in which the intensity of infestation was much higher than in other experiments. Additional information on these tests are given later in this paper.

Much of the geographical variation in the resistance of Pawnee appears to be explainable by the existence of different strains of the fly in this region (Painter et al., 1931). There also is some evidence of a change in the composition of the fly population as measured by its ability to infest different varieties of wheat. Among the records given for Kawvale (table 2) the average for the first five tests at Manhattan showed an infestation of 5 percent in Kawvale and 67 percent in Tenmarq. A similar average for the last five tests at Manhattan showed an infestation in Kawvale of 30 percent and Tenmarq 79 percent. The increased infestation in Kawvale during this period (1924-42) is certainly not due to an increase in the level of infestation, but may be due to a change in the population.

In table 5 are given records of natural hessian fly infestation in plots of Kawvale and Tenmarq at Columbus, in extreme southeastern Kansas. These show that in the falls of 1928 and 1929 Kawvale had about one-half as high an infestation as Tenmarq. In 1941 there was a widespread outbreak of the hessian fly in southeastern Kansas. In this area in the intervening time Kawvale had become the dominant variety. No counts were available in 1941, but inspections of plots of Kawvale and Tenmarq and of numerous fields of Kawvale indicate that there were small if any differences between winter wheat varieties, including Kawvale, as measured by the percentage of plants infested.

Table 5.—Hessian fly infestation records in Kawvale and Tenmarq at Columbus, Kans.

Year and test	Infestation in Kawvale in terms of plants infested in	Actual plants infested	
	Tenmarq in the same tests	Kawvale	Tenmarq
	Percent	Percent	Percent
Fall, 1928	47	18	38
Spring, 1929	16	13	80
Fall, 1929	59	51	87

Haseman (1933) reported that Illini Chief and other winter wheats that had shown considerable resistance to the fly in earlier experiments in Missouri did not show much resistance at the time of his tests.

The observations and records taken together seem to suggest that the part of the fly population able to infest Pawnee and Kawvale has been moving westward, or that the proportion of this strain has been increasing in the fly populations of the more western counties. This would indicate that an increase may be expected in the infestation of Pawnee, as measured by the percentage of plants infested, as the acreage of this variety in central Kansas increases.

Resistance of Pawnee wheat as measured by condition of hessian fly puparia and larvae.—A considerable number of hessian fly puparia from Kawvale, Pawnee, and Tenmarq have been weighed and measured, and typical average results are recorded in table 6. In some tests too few puparia were removed from the resistant varieties, but whenever an adequate sample has been obtained the puparia from Pawnee have averaged shorter than those from Tenmarq. In such tests this difference has been shown to be highly significant. The puparia removed from both Kawvale and Pawnee have weighed less on the average than those from Tenmarq. The average weight was calculated from the total weight of puparia from each kind of wheat; therefore statistical tests could not easily be applied. In measuring the length of puparia taken from different varieties, both the largest and smallest puparia have been found in Pawnee. Furthermore, the coefficient of variability nearly always has been higher for the puparia removed from Pawnee

Table 6.—Number of hessian fly puparia removed from Kawvale, Pawnee and Tenmarq wheats and their average length and weight

Variety	Manhattan, fall, 1940				Manhattan, fall, 1942			
	Puparia	Average length	Coefficient of variation		Puparia	Average weight	Puparia	Average weight
			Percent	Number				
Kawvale	118	3.37	16	22	0.96	—	—	—
Pawnee	86	3.44	13	56	1.24	132	1.06	—
Tenmarq	369	3.57	13	108	1.41	157	1.69	—
Difference between Pawnee and Tenmarq		.13 ¹				.17		.63

Variety	Manhattan, fall, 1942						Harvey County spring, 1943		
	First sample			Second sample			Coefficient		
	Average of Puparia length variation			Average of Puparia length variation			Average of Puparia length variation		
	Number	Mm	Percent	Number	Mm.	Percent	Number	Mm	Percent
Kawvale	—	—	—	—	—	—	—	—	—
Pawnee	538	3.86	16	471	3.30	15	195	3.37	19
Tenmarq	542	3.57	12	333	3.44	12	222	3.65	12
Difference		.29 ¹			.14 ¹			.28 ¹	

¹ Highly significant.



Fig. 3.—Representative wheat plants of the same age removed from fields of A. Pawnee and B. Tenmarq. The plant on the left in each row is uninfested; the others are infested and show various degrees of injury by the Hessian fly.

than for those removed from Tenmarq. This greater variability in puparia from Pawnee is perhaps further evidence of the presence of different strains of the fly.

Repeated observations made while taking records of infestation on Pawnee, Kawvale, and Tenmarq appear to indicate that development of the hessian fly is slower on Pawnee and Kawvale than on Tenmarq. In samples taken at the time when puparia are developing, most of the flies removed from Tenmarq will have already reached the puparium stage, while most of the forms taken from Pawnee and Kawvale still will be small larve (fig. 1). Detailed life-history studies on these varieties, however, have not yet been made.

In the spring of 1943, more than one thousand puparia from Tenmarq and Pawnee were placed in separate bottles, and adult flies were permitted to emerge from them under conditions as nearly comparable as possible. Flies emerged from 69 percent of the puparia removed from Tenmarq and from only 53 percent of those removed from Pawnee. This difference of 16 percent, while statistically significant, may not be due entirely to the varieties, because it was necessary to obtain these puparia from different but neighboring fields. Casual observation of similar lots of puparia tend to confirm the view that there is possibly a somewhat higher mortality in puparia removed from Pawnee than in those removed from Tenmarq. Furthermore, occasional dead larvae have been observed on Pawnee and Kawvale but not on Tenmarq. Under some conditions in the greenhouse, and less frequently in the field, the smaller puparia on these resistant varieties have been observed to be pushed out from behind the sheath by the growth of the wheat tiller.

The resistance of Pawnee as measured by the damage to and survival of infested plants.—Both Pawnee and its resistant parent, Kawvale, show a high degree of tolerance or ability to recover and produce wheat crops in spite of infestation. This tolerance takes many forms, some of which cannot easily be measured quantitatively. It is shown best by pictures (Figs. 3, 4, 5), which indicate the difference in the amount of growth of individual plants following infestation. In Tenmarq and other susceptible varieties there are many more infested plants that appear to be similar to those in Figure 3, B, right, than are ever found in Pawnee or Kawvale. It will be noted that the infested plants of Pawnee differ from those of Tenmarq, not only in their greater leaf growth, but also in their ability to tiller after infestation. Both these factors are important when wheat is used as pasture, as is done in many parts of central and western Kansas. A considerable number of these smaller plants die after infestation, either before or during the winter. The differences in tolerance and degree of infestation between Pawnee and Turkey are apparent in figure 4. These differences during the fall are reflected in the straw and grain produced the next spring (Fig. 5). The spring generation of the fly causes additional damage, and fewer heads



Fig 4—Adjacent rows of Pawnee (1001) and Turkey (1002) in the Manhattan, Kans. Hessian fly nursery in November 1942, indicate the difference in growth following infestation. A small stake marks each infested plant. In Turkey, 92 percent of the plants were infested, but in Pawnee only 33 percent.

are produced on susceptible varieties than on Pawnee. The appearance of the plants shown in Figure 5 reflects this spring difference as well.

In addition to the difference shown in these photographs between susceptible and resistant varieties, there is considerable difference in the survival of infested plants of Pawnee, as contrasted with the survival in susceptible varieties, such as Tenmarq and Turkey. Examples of this type of



Fig 5—Total plants collected from the rows of Pawnee (1) and Turkey (2) in June 1943, from the same rows shown in figure 4 in an earlier stage of growth

tolerance were found in detailed observations of 600 infested plants in the Manhattan nursery, where 16 percent of these plants in the variety Turkey, 6 percent in Tenmarq, and none in Pawnee were dead on November 25, 1942, whereas 71, 33, and 6 percent, respectively, were dead on March 15, 1943. The data on these infested plants were taken from adjoining rows, the same plants being observed in November and again in March. The data show that an appreciable number of the infested plants of Turkey and Ten-

marq die before they have encountered much winter weather, and a larger proportion of such plants die during the winter. In Pawnee, on the contrary, few dead infested plants are ever found, even in the spring. Normal, uninfested plants of Turkey are much more winter hardy than are plants of Tenmarq and somewhat more winter hardy than plants of Pawnee. The degree to which tolerance, as measured by the survival of infested plants, occurs is usually roughly proportional to the intensity of infestation, but is also greatly influenced by the age of the plants at the time of infestation and by the moisture conditions and fertility of the soil.

This difference in tolerance between Kawvale or Pawnee, and Tenmarq or Turkey, does not appear to be associated to a great extent with the area in which the test is grown. It was observed in the case of Kawvale in Missouri (Etheridge and Helm 1938) and in Leavenworth County, Kans., in 1932 and on several occasions at Springfield, Mo. For instance, in the extremely heavy infestation at the latter locations in 1935-36 Kawvale had the highest survival after infestation of any commercial winter wheat—a survival, however, of only 21 percent in this case.

Combined resistance and tolerance of Pawnee as reflected in yield under hessian fly infestation.—As indicated earlier, Pawnee has averaged about 17 percent higher in yield than Tenmarq under a wide range of Kansas conditions when the hessian fly was absent or infestations were only light. During the last 3 years records have been made whenever possible of the infestation of Pawnee and Tenmarq in cooperative tests conducted by the Kansas Department of Agronomy. The results of these infestation studies and the yields from the same plots are given in table 7. It may be noted that, in general, as the level of infestation increased the difference in yield between Pawnee and Tenmarq also increased. For instance, in the five counties where infestation records were taken in the spring of 1942, 76 percent of the Tenmarq plants were infested and Pawnee had 22 percent of plants infested, which was 29 percent of the infestation of Tenmarq. The average increase in yield of Pawnee over Tenmarq was 8.5 bushels, or 31 percent. In the spring of 1943, three counties in south-central Kansas, McPherson, Sedgwick, and Harvey, had 100 percent of the Tenmarq plants infested, and the infestation in Pawnee was 75 percent of that in Tenmarq. The average increase in yield of Pawnee over Tenmarq was 13.3 bushels, or 83 percent.

The relationship between yield and hessian fly infestation, as measured by the percentage of plants infested, does not appear to be a simple one. This is to be expected, since yield normally depends on many different factors. There are also indications in table 7 that phases of the resistance of Pawnee, other than percentage of plants infested, may be of equal or greater importance as reflected in yield. For instance, in Sedgwick County in 1943 the difference in infestation between Pawnee and Tenmarq was only 18 percent, yet the difference in yield was 66 percent, and in Harvey County the same year the difference between Pawnee and Tenmarq in plants infested was 6 percent, yet the difference in yield was 70 percent. In the latter case

Table 7.—Relation of hessian fly infestation to yield in various parts of Kansas. Vacant places in table indicate lack of data.

County and Harvest Year	Pawnee				Tenmarq			
	Fall. infested plants	Spring. infested—Plants	Tillers	Yield per acre	Fall. infested plants	Spring. infested Tillers	Yield per acre	Relation to Tenmarq
	Percent	Percent	Percent	Bushels	Percent	Percent	Bushels	Percent
Central and N.E. Kansas tests:								
Nemaha, 1941	1	13	34.2	12	76	21.9	12.3	56
Clay, 1941		38	34.9		89	36.6	-1.7	-5
Marshall, 1941	10	16	16.4	22	42	Not harvested		
Marshall, 1942		8	40.0		84	25.7	14.3	56
Ottawa, 1942		2	38.8		72	35.5	3.3	9
Dickinson, 1942		12	26.8		60	33	10.4	63
McPherson, 1942	5	20	39.2	14	68	31.9	7.3	23
Reno, 1942	42	8	32.7		94	46	25.7	27
Sumner, 1942	8	12	31.4	16			28.6	10
Russell, 1943		0	37.5		24	34.7	2.8	8
Smith, 1943		0	21.9		40	22.1	-0.2	-1
Jewell, 1943		0	27.7		68	28.8	-1.1	-4
Marshall, 1943		8	41.3		86	38.2	3.1	8
Republic, 1943		8	21.9		64	14.2	7.7	54
Morris, 1943	4				29			do.
Mitchell, 1943	16		47.5		60	33.6	13.9	41
Kingman, 1943	8		22.7		28	14.7	8.0	54
Washington, 1943	20		27.7		64	21.8	5.9	27
Saline, 1943	17		30.9		48	28.2	2.7	10
Brown, 1943	32		25.6		92	14.6	11.0	-5
McPherson, 1943	48	8	17.9		100	57	8.4	113
Sedgwick, 1943	82		36.4		100	21.9	14.5	66
Clay, 1943	72		51.8		80	29.5	22.3	76
Harvey, 1943	94	28	38.6		100	47	15.9	70
Reno, 1943	..12		27.3	50		11.7	15.6	133
Eastern Kansas tests:								
Atchison, 1941	34	31	45.4	56		26	31.3	45
Wabaunsee, 1942		77	25.0		78	32	19.0	60
Shawnee, 1943		72	29.4		72		24.8	19

1 Experimental fields.

2 Planted after safe seeding date

3 Injury to Tenmarq evident in field.

the damage by the fly was done entirely by the spring generation, since the test was planted after the safe seeding date and received little or no fall infestation. Hence the ability of Pawnee both to produce grain and to survive the winter under heavy fly infestation is an important characteristic of the variety.

The tests in eastern Kansas gave further indication of the inadequacy of the percentage of plants infested as a measure of the resistance of Pawnee wheat. Although the percentages of infested plants in Pawnee and Tenmarq were about equal, in these tests the difference in yield was great and larger than the average difference in yield when the hessian fly was present in only small numbers, as reported by Reitz and Laude (1943) and as discussed under "Review of Literature."

In years of severe hessian fly outbreaks many cases of crop failure have been due to the death of the fall-infested wheat plants. The consequent abandonment of fields in the fall or early in the spring has contributed greatly to the losses caused by this insect in central Kansas, and even more to the losses suffered by individual farmers. Taken together with observations in severe infestations of the hessian fly in nurseries, the yield data presented indicate that when Pawnee is used in the area in which it is adapted there is little possibility of a complete crop failure due to fly damage.

Measuring resistance to the hessian fly in Pawnee wheat—As has been repeatedly indicated in this paper, the percentage of plants infested does not completely, and sometimes does not correctly, measure the difference between Pawnee and such susceptible varieties as Tenmarq and Turkey. Neither, for that matter, does any other single criterion. Although yield is affected by many factors besides hessian fly resistance, and some of these factors, such as resistance to disease, may be of dominant importance in some years, yield is perhaps the best single measure of the combined resistance and tolerance of Pawnee under heavy fly infestation. For a correct evaluation, however, the several methods of measuring resistance in addition to percentage of plants and tillers infested must be considered. It is especially necessary to consider the survival of infested plants and the ability of Pawnee to replace infested tillers or to produce adequate vegetative growth and heads, regardless of infestation. It is much more difficult, however, to get a quantitative measure of these last-named characteristics.

Possible changes in status of resistance in Pawnee wheat to hessian fly.—It seems probable, from the superior characteristics of the variety, that the use of Pawnee is likely to spread quickly, and that this wheat will occupy considerable acreage in the area to which it is adapted. The evidence presented of a geographical limitation of the part of Pawnee resistance that is measured by percentage of plants infested, and the evidence of a possible westward increase in the eastern type of fly, bring up the question of the permanence of Pawnee's resistance under Kansas farm conditions. This question already has been discussed by Painter (1941, p. 362) in general

terms. The case of Pawnee, which was studied at that time, had a bearing on this discussion. Little can be added to the seven factors mentioned at that time. The present writers have no evidence to indicate how much change may be expected in the fly resistance of Pawnee; neither do they have any information on how rapidly or how far west the eastern type of fly is likely to spread. This may depend in part on the ability of the eastern strain to survive or to develop under the drier condition of central and western Kansas.

There seems to be good evidence, however, that the westward spread of the eastern type of fly may result in some increase in infestation of Pawnee. On the other hand it has been shown earlier in this paper that the tolerance factors possessed by Pawnee are effective against the eastern as well as the western type of fly, and apparently will not be affected, except as related to an increase in the number of plants or tillers infested. Even if there should be a considerable decrease in the resistance of Pawnee, this variety would continue to be a superior wheat for other reasons. Furthermore, certain hybrids from other parent varieties of wheat now under test are much more fly resistant than Pawnee. New varieties from these hybrids may eventually replace Pawnee if it becomes susceptible to infestation.

The place of Pawnee in hessian fly control.—It seems evident from what has been said that other control measures for the hessian fly in addition to the use of Pawnee should be employed where possible, in order to increase the effect of Pawnee resistance on yield and to delay the spread and multiplication of hessian fly strains that are able to breed on Pawnee. In table 7 it is shown that one of the greatest difference in yield between Pawnee and Tenmarq occurred in 1943 in Harvey County in a test which, because other means of control had been employed, had little, if any, fall fly infestation. Regardless of other control measures employed and of the possible increase in susceptibility of Pawnee, farmers can obtain some degree of automatic fly control through the use of that variety. Because of the effectiveness of the tolerance factors, it appears that complete crop failures due to fly infestation are not likely to occur where Pawnee is planted. Such complete crop failures from fly infestation have occurred repeatedly in central Kansas on individual farms where the present nonresistant hard, red winter wheats have been planted.

One of the important advantages to be gained from the use of Pawnee is a possible increase in available pasturage as a result of its resistance to both rust and the fly in the fall. In many parts of Kansas the use of wheat as fall, winter, and early-spring pasture approaches in importance its use as a grain crop. This value of Pawnee cannot be stressed too greatly. In years and locations in which there is little danger of a hessian fly outbreak, it may be possible to plant Pawnee somewhat earlier than susceptible varieties could be planted and thus to obtain additional value from its use as a pasture crop.

In regard to fly infestation and injury, differences similar to those between Pawnee and Tenmarq also occur between Pawnee and other hard, red winter wheats, such as Turkey and Comanche, for which less detailed data are available.

Summary.—The wheat variety Pawnee is a selection of Kawvale \times Tenmarq and is a result of a cooperative breeding project directed in part toward the production of a hessian fly-resistant wheat for central Kansas. This new variety, however, has other outstanding characteristics of commercial value.

The value of Pawnee is a result of both tolerance and resistance to the fly in central Kansas and is shown by (1) a 50-percent lower infestation than the susceptible variety Tenmarq, as measured by percentage of plants infested; (2) approximately a 75-percent lower tiller infestation, as compared with the susceptible variety Tenmarq; (3) a decrease in the size of puparia and a decreased rate of development, and perhaps other biological differences; (4) comparatively low fly injury to infested plants, especially in the fall, and to individually infested tillers in both fall and spring; and (5) an excess in yield in comparison with Tenmarq, up to more than twice as much as the latter variety under heavy fly infestation. In evaluating the hessian fly resistance of Pawnee, it is necessary to consider all these factors.

Evidence has been presented that resistance, as measured by percentage of plants infested, may be decreasing, because of the westward migration and survival of strains of the fly that are able to infest such varieties as Pawnee and Kawvale. The tolerance factors do not appear to be greatly affected by any differences in the resistance of Pawnee to the strains of fly prevalent in different areas. If the sowing of Pawnee reduces fly damage in central Kansas for only a few years, it will prove of great economic value and, even though this resistance may be lost, Pawnee would still have the other desirable characteristics to recommend it.

Pawnee should be used primarily as an additional means of hessian fly control, and if so used will give increased yield under fly conditions. The use of other control measures possibly will delay the spread or development of the type of fly able to survive on Pawnee.

Owing to its tolerance and resistance, the use of Pawnee wheat reduces the possibility of total crop failure from fly infestation.

Literature Cited

- (1) Clark, J. A. 1943. Registration of improved wheat varieties. *Jour. Amer. Soc. Agron.*, 35: 245-248.
- (2) Etheridge, W. C., and Helm, C. A. 1938. Wheat in Missouri. *Missouri Agr. Expt. Sta., Bul.* 398, 41 pp.
- (3) Haseman, L. 1933. Hessian fly resistant varieties of wheat. *Missouri Agr. Expt. Sta., Bul.* 328:29.
- (4) Hollingsworth, H. S. 1933. The inheritance of resistance to hessian fly in a cross between Tenmarq and Kawvale wheat. Master's Thesis. Kansas State College. [Unpublished.]
- (5) Jones, E. T. 1943. Insect resistance in wheat. *Jour. Amer. Soc. Agron.*, 35:695-703.
- (6) Kelm, F. D. 1943. Agronomy and human beings. *Jour. Amer. Soc. Agron.*, 35:995-1001.

- (7) Kiesselbach, T. A., Anderson, A. and Suneson, C. A. 1933 Winter wheat varieties in Nebraska. Nebr. Agr. Expt. Sta., Bull. 283. 24 pp.
- (8) Painter, R. H., Salmon, S. C., and Parker, J. H. 1931 Resistance of varieties of winter wheat to hessian fly. Kans. Agr. Expt. Sta., Tech. Bul. 27. 58 pp.
- (9) Painter, R. H., Jones, E. T., Johnston, C. O., and Parker, J. H. 1940 Transference of hessian fly resistance and other characteristics of Marquillo spring wheat to winter wheat. Kans. Agr. Expt. Sta., Tech. Bul. 49, 55 pp.
- (10) Painter, R. H. 1941 The Economic value and biological significance of insect resistance in plants. Jour. Econ. Ent., 34:358-367.
- (11) Quisenberry, K. S., and Kiesselbach, T. A. 1943 Improvement of small grains. Nebr. Agr. Expt. Sta., Ann. Rpt. 56:15-18.
- (12) Reitz, L. P. and Laude, H. H. 1943 Comanche and Pawnee: New varieties of hard red winter wheat for Kansas. Kans. Agr. Expt. Sta., Bul. 319, 16 pp.
- (13) Reitz, L. P., Jones, E. T., Johnston, C. O., and Painter, R. H. 1943 Agronomic tests of new resistant varieties and hybrids of hard red winter wheat in the presence of stem rust and hessian fly. Jour. Amer. Soc. Agron., 35:216-229.
- (14) Snedecor, G. W. 1940. Statistical methods. Ed. 3. 422 pp. Iowa State College Press. Ames, Iowa.
- (15) Suneson, C. A., and Kiesselbach, T. A. 1934 Differential varietal responses of winter wheat to time of planting. Jour. Amer. Soc. Agron., 26:294-296.

FOUR NEW SPECIES IN THE GENUS *BAKERELLA* (Homoptera-Fulgoridae-Delphacinae)

R. H. BEAMER*

The genus *Bakerella* was described by David L. Crawford (Proc. U.S.N.M., Vol. 46, p. 601, 1914) with the Mexican species *Bakerella maculata* as genotype. The specimens of this genus from America north of Mexico have heretofore not been separated from *B. maculata*. The present paper describes four new species. The specimens of these were compared with the type of *B. maculata* in the United States National Museum by Doctor John Caldwell. It is his opinion that they are undescribed.

Key to the Species

- | | |
|--|----------------|
| 1. General form very robust (Mexico) | 2 |
| General form more slender | 2 |
| 2. Frons almost as wide as long | 3 |
| Frons much longer than wide | 3 |
| 3. Anal ring of male without processes | 4 |
| Anal ring with processes | 4 |
| 4. Long wing forms with broad diagonal, fumose band from costa to mesal margin on outer third of clavus; aedeagus swollen dorsally on basal half | fusca n. sp. |
| Long wing forms with barely a spot left of diagonal band; aedeagus swollen ventrally on basal half | cinerea n. sp. |

* Contribution from Department of Entomology, University of Kansas, Lawrence, Kan.

1. *Bakerella fusca* n. sp.**Macropterous form**

Resembling *B. maculata* Crawford but less robust, median fovea of crown broader and slightly shorter. Length male 2.75-3 mm.

Structure: Front about twice as long as wide, oval in shape, about as wide at union with clypeus as next crown; crown slightly longer than width between eyes, anterior fovea about twice as long as width at base, posterior fovea about twice as wide at base as length at middle; veins of elytra sparsely set with small, rounded projections.

Color: Front brown with three or four pairs of small mesal spots, usually one pair near clypeus, one pair just above middle and two pairs near union with vertex; three marginal spots, one near middle, one just above it and one near union with crown, light. Crown brown with lateral carina, base and sometimes other carina, light. Pronotum brown with mesal carina, posterior margin and sometimes a spot back of lateral carina, light. Elytra hyaline with diagonal band from spot on mesal border near apex of claval veins to costal margin more or less paralleling posterior margin of pronotum, band on cross veins extending to apex on Cu and M₁₊₂ and small round bumps on veins, brown. Venter variegated, more brown than light.

Genitalia: Styles in lateral view widest at base, contracted on basal fourth, narrowed to apex and gently curved ventrally near middle; aedeagus in lateral view widest just beyond base, then narrowing on dorsal margin with about five retrorse dorsal teeth just before bluntly pointed apex. Anal segment with a pair of contiguous processes enlarged near their middle and about as long as diameter of segment.

Holotype male and 1 male paratype, Apache Co., Arizona, July 16, 1927, P. A. Readio. Types in the Snow Entomological Collections.

2. *Bakerella cinerea* n. sp.**Brachypterous form**

Resembling *B. fusca* but wings cinereous instead of hyaline, diagonal dark stripe almost lacking, aedeagus swollen basally on ventral side instead of dorsally and apex with much larger teeth, not evenly spaced. Length: male 1.5 mm.; female 1.75-2 mm.

Structure: Front oval, widest just above middle, slightly wider at union with crown than with clypeus; crown rectangular, about one fourth longer than width between eyes, anterior fovea about twice as wide as long, posterior fovea about twice as long as wide, divided longitudinally with a ridge; elytra reaching to second abdominal segment, apices rounded, longest near middle of inner half, female more nearly truncate than in male, veins raised, rather evenly and sparsely set with round bumps.

Color: Front brown, usually with four pairs of small mesal light spots, one pair near distal end, one pair midway between middle and clypeus, one just above middle and one almost at union with crown; four marginal light spots, one at apex, one about the middle, another opposite middle spots and the

other near union with crown, all usually crossing lateral ridge and face; crown and pronotum dark with ridges usually lighter; elytra cinereous with rounded bumps on veins, two spots on mesal margin, one near middle and other at apex of clavus and a rather broad band at apex of elytra, except two mesal white spots, brown; venter brown to black, more or less spotted with light. pygofer and ovipositor of female black, bordered by light-margined notch of last ventral segment.

Genitalia: Styles about as in *B. fusca*; aedeagus in lateral view enlarged on ventral margin for basal two thirds, then constricted on outer fourth to less than one third greatest width, tip somewhat enlarged again on ventral side with five large, different-sized teeth on apical third of dorsal margin, anal segment about as in *B. fusca*.

Holotype male, allotype female, 16 male and 28 female paratypes, Lawrence, Kansas, Sept. 20, 1944, R. H. Beamer; other paratypes: 1 male and 2 females, August 23; 2 males and 1 female, September 4, same place, year and collector; 14 males and 7 females, Douglas Co., Kansas, Oct. 19, 1944, R. H. Beamer; 39 males and 17 females, Oct. 17; 2 males and 1 female, Oct. 18; 2 males Nov. 18; 1 male, Oct. 26, same place, year and collector.

Macropterous form

Like the short-winged form except wings much longer than abdomen. Length male 3.25 mm. Elytra cinereous to semihyaline, veins raised with black bumps except on claval suture, black spot on mesal margin near basal third of clavus, another almost at apex, a third near center of corium on a diagonal with this last spot and costal margin, all parallel with posterior margin of pronotum; broad, dark band on cross veins running to apex of elytra along veins M_{1+2} , Cu_1 and Cu_2 .

Holomorphotype male, Lawrence, Kansas, August 23, 1944, R. H. Beamer, and 2 male paramorphotypes, same place and collector, Sept. 20, 1944; 1 male paramorphotype, Douglas Co., Kansas, August 17, 1944, R. H. Beamer.

Types in the Snow Entomological Collections. The specimens of this species were swept from the sedge, *Eleocharis palustris* (L.).

3. *Bakerella rotundifrons* n. sp.

Brachypterous form

Resembling *B. cinerea* but front almost as wide as long, anal hooks of male forming a rounded curve and aedeagus with many spines on apical portion. Length female 1.75-2.25 mm.; male 1.25-1.75 mm.

Structure: Front almost as wide just above middle as median length, at union with clypeus slightly narrower than half greatest width; crown rectangular, about a third longer than wide, anterior fovea about three times as long as basal width, carinae distinct; elytra about as long as head and pronotum, oval in outline, veins definite with rather evenly arranged raised round black bumps, dorsal segments of abdomen with rather sharp median keel, the third segment with a pair of raised bumps on each side and the fourth with three smaller raised places on each side.

Color: The general color varies from buff to dark brown with the lighter individuals predominating. Front buff with at least a darker spot at apex and often apical third darker, usually four pairs of median and three marginal spots lighter; carina of crown and pronotum usually lighter; elytra semihyaline with raised round bumps on veins and two larger spots at apex dark brown; venter much darker than dorsum.

Genitalia: Male styles in lateral view almost straight, widest at base; sharply narrowed, then tapered to rounded apex; aedeagus in lateral view, with sides almost parallel and widest on basal two thirds, gently curving ventrally and narrowing on outer third, narrowed portion except apex covered with fine teeth; anal hooks broad at base, evenly curved ventrally from base to apices.

Holotype male, allotype female, 57 males and 42 females, Sun City, Kansas, Sept. 14, 1944, R. H. Beamer; other paratypes: 11 males and 16 females, Meade Co., Kansas, Sept. 9, 1944, R. H. Beamer; 2 males and 1 female, Douglas Co., Kansas, Oct. 17, 1944, R. H. Beamer; 1 male and 2 females, same place and collector, Oct. 20, 1944; 5 males and 8 females, Lawrence, Kansas, Sept. 20, 1944, R. H. Beamer.

Macropterous form

Resembling brachypterous forms but larger, generally darker and with wings about a third longer than body. Length of body 2 mm., to tip of wings 2.75 mm. Elytra hyaline except diagonal fuscous band from apices of claval veins to costa, paralleling pronotum and broader band on cross veins and extending to apex on M_2 and M_{3+4} ; veins raised with rather evenly spaced, round, black bumps.

Holomorphotype female and 6 female paramorphotypes, Sun City, Kansas, Sept. 14, 1944, R. H. Beamer.

Types in the Snow Entomological Collections.

4. *Bakerella bidens* n. sp.

Brachypterous form

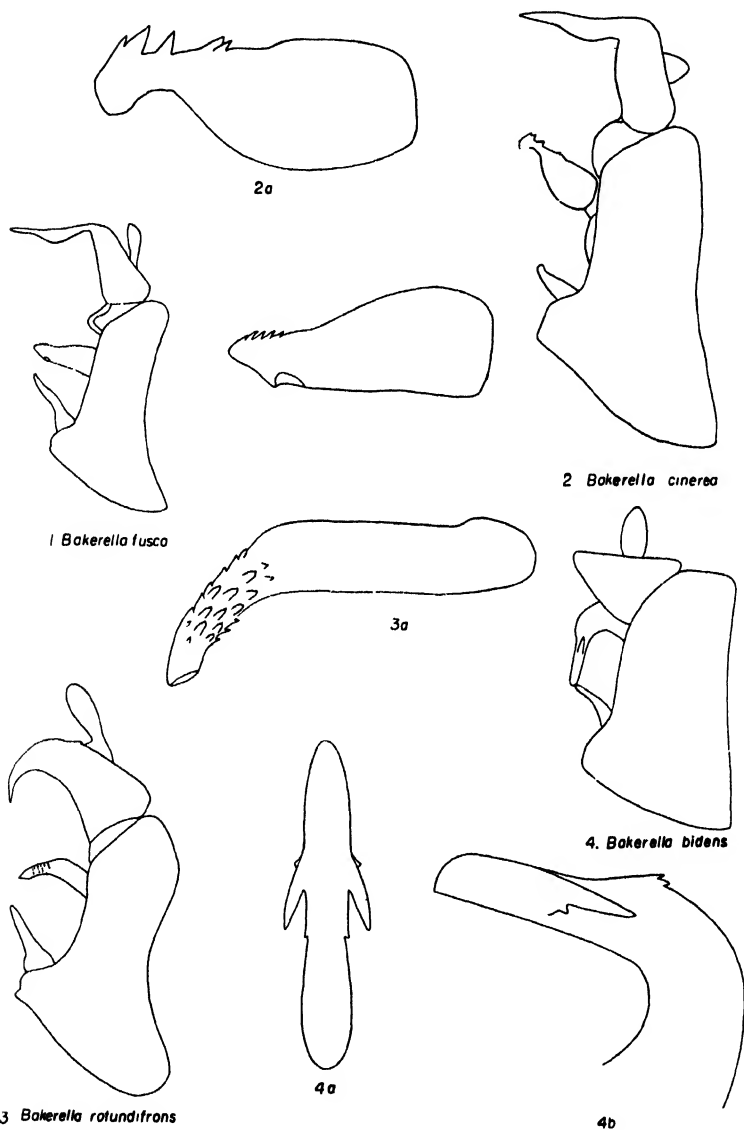
Resembling *B. cinerea* but front narrower, round bumps on veins of wings very slightly darkened if at all, male aedeagus bent ventrally at a right

Explanation of Plate

1. Lateral view of male genitalia *Bakerella fusca* n. sp.
- 1a. Lateral view of aedeagus of *Bakerella fusca* n. sp.
2. Lateral view of male genitalia *Bakerella cinerea* n. sp.
- 2a. Lateral view of aedeagus of *Bakerella cinerea* n. sp.
3. Lateral view of male genitalia of *Bakerella rotundifrons* n. sp.
- 3a. Lateral view of aedeagus of *Bakerella rotundifrons* n. sp.
4. Lateral view of male genitalia of *Bakerella bidens* n. sp.
- 4a. Dorsoventral view of aedeagus of *Bakerella bidens* n. sp.
- 4b. Lateral view of aedeagus of *Bakerella bidens* n. sp.

angle and anal segment without hooks. Length male 1.75-2.25 mm; female 2-2.5 mm.

Structure: Clypeus and front joined almost on same level, front definitely



widest at middle, about same width at union with clypeus and crown, strongly carinate; crown in male almost square, in female longer than wide, anterior fovea about twice as long as basal width. Elytra of male longer than wide, reaching about to third abdominal segment, apices broadly rounded, veins raised with a few raised, round, scarcely darkened bumps, some of which bear setae. Dorsum of abdomen carinate at middle with semblance of raised bumps on sides of third and fourth segments.

Color: General color ranging from buff to cinereous with most specimens lighter. Front with spots as in *B. cinerea* often absent in lighter specimens. In male, elytra hyaline with apical third fuscous except apical border white, in female, hyaline with two to three apical spots fuscous with apical margin white.

Genitalia: Male styles in lateral view widest at base, tapered to rounded apex, gently curved ventrally; aedeagus in lateral view widest at base, tapered to apex, more suddenly so near outer third, bent ventrally at right angles near middle with a large retrorse spine near apical fourth about as long as width of shaft at this point; anal ring without processes.

Holotype male, allotype female and 81 male and 17 female paratypes, Meade Co., Kansas, Sept. 13, 1944, R. H. Beamer. All specimens were swept from sedges near the big spring at the Meade County State Park.

Types in the Snow Entomological Collections.

THE SWEETPOTATO LEAF BEETLE *TYPOPHORUS* *VIRIDICYANEUS* (CROTCH) IN KANSAS

H. B. HUNGERFORD
Lawrence, Kansas

In September of this year we received complaints from Oxford, Kansas, of injury to sweetpotatoes by some insect larvae, thought to be the sweetpotato weevil. Mr. L. A. Calkins, assistant entomologist of the Entomological Commission, who investigated the situation, reported that he found considerable injury to sweetpotatoes by some white grub-like larvae which were not those of the sweetpotato weevil. He brought damaged sweetpotatoes to the office and we determined the larvae to be the sweetpotato leaf beetle and this was verified by Doctor W. H. Anderson of Washington, D.C. Since this was our first experience with this insect as a pest in Kansas and since Loyd W. Brannon (1938) in his "The Sweetpotato Leaf Beetle," Circular 495, U.S. Department of Agriculture, does not mention Kansas, the following data taken from specimens in the Frances Huntington Snow Collections may be of interest:

Douglas County, Kansas, 900 feet, L. L. Dyche, 1 specimen.

Douglas County, Kansas, 900 feet, F. H. Snow, 17 specimens.

Lawrence, Kansas, August 4, 1927, W. Benedict, 1 specimen.

Johnson County, Kansas, (June 14), 1915, R. H. Beamer, 2 specimens.

Neosho County, Kansas, 996 feet, R. H. Beamer, 1 specimen.

New Mexico, F. H. Snow, 24 specimens.

Iowa, U.S.A., America Nord, 1 specimen.

Wall, Pennsylvania, August 3, 1926, Chermock, 3 specimens.

The collections by Doctor Snow and Mr. Dyche were made more than fifty years ago and probably considerably earlier than that, while Doctor Beamer got his specimens thirty years ago.

Crotch described the species under the name *Paria viridicyanea* in 1873 and gave as its distribution "Middle and Southern states, Illinois, Mexico." Chittenden, 1925, lists it on sweetpotatoes in North Carolina, South Carolina, Arkansas, Mississippi and Texas. Brannon, 1938, reports records from Maryland, Virginia, Kentucky, Tennessee, Georgia and Alabama. Leng, 1920, in his catalogue, lists Virginia, Florida, Mexico, Indiana and Southern California. Thus the states of Pennsylvania, Iowa, Kansas and New Mexico appear to be new records.

INDEX—VOLUME 18

Bakerella (Homoptera-Fulgoridae-Delphacinae), Four New Species in the Genus	149	Lawson, Paul B., Article by	49
Beamer, R.H., Articles by 48, 49, 83, 100, 149		<i>Mansonia indubitans</i> Dyar and Shannon—A New Mosquito Addition to the United States Fauna	121
Butterflies, Notes on Kansas	111	Muscoid Flies, New Genera and Species of	67
Butterflies (Rhopalocera) Collected in Cowley County in 1944, A List of	112	Painter, Reginald H., Article by	130
Butterflies, Two New Races of	82	Penner, Lawrence R., Article by	30
Dean, George A., Articles by	84, 85	Pratt, Harry D., Article by	121
Dikraneura from Arizona (Homoptera-Cicadellidae), A New Species of	83	Psyllidae of Mexico, Contributions to the Knowledge of	1
Dolichopodidae from Michigan (Diptera), New	77	Reinhard, H. J., Article by	67
Dorydiella from Kansas (Homoptera-Cicadellidae), A New Species of	48	Sailer R. I., Article by	81
Harmston, F. C., Article by	77	Siphonaptera A New Species of <i>Conorhinopsylla</i> from Kansas	109
Hessian Fly Resistance of Pawnee Wheat, The	130	Smith, Roger C., Article by	85
Hungerford, H. B., Article by	154	Stallings, Don B., Articles by	82, 111
Jellison, William L., Article by	109	Stragania (Bythoscopus of Authors) in America North of Mexico (Homoptera-Cicadellidae), A Revision of the Genus	49
Jones, Elmer T., Article by	130	Summary, The Fourteenth or 1944 Annual Insect Population of Kansas	85
Kellsia in America North of Mexico (Homoptera-Fulgoridae-Delphacinae) The Genus	100	Turner, J. R., Articles by	82, 111
Kelly, E. G., Article by	85	Tuthill, Leonard D., Article by	1
Knowlton, G. F., Article by	77	<i>Typophorus viridicyaneus</i> (Crotch), The Sweetpotato Leaf Beetle in Kansas	154
Lacebug, <i>Corythucha cydoniae</i> , The Bite of a	81	Weniger, Delbert, Article by	112
Laccocera Van Duzee (Homoptera-Delphacidae), The Genus	30	Index to volume 18	156

PRICE OF BACK VOLUMES

Back Volumes \$2.50 per volume

Subscriptions for back volumes or numbers should be sent to Donald A. Wilbur, Department of Entomology, Kansas State College, Manhattan, Kansas.

CONTENTS OF THIS NUMBER

Mansonia indubitans Dyar and Shannon—A New Mosquito Addition to the United States Fauna.	
HARRY D. PRATT	121
The Hessian Fly Resistance of Pawnee Wheat	
REGINALD H. PAINTER and ELMER T. JONES	130
Four New Species in the Genus Bakerella	
R. H. BEAMER	149
The Sweetpotato Leaf Beetle <i>Typophorus viridicyaneus</i> (Crotch) in Kansas	
H. B. HUNGERFORD	154
Index to Volume 18	156

Journal of the Kansas Entomological Society

Volume 19

January, 1946

Number 1

PUBLICATION COMMITTEE

PAUL B. LAWSON, Editor, Lawrence
R. H. BEAMER, Lawrence R. H. PAINTER, Manhattan
DWIGHT ISELY, Fayetteville, Ark.



JAMES WALKER McCULLOCH
1889-1929

Entered as second-class matter September 16, 1939 at the Post Office at
Manhattan, Kansas, under the Act of August 24, 1912.

JOURNAL OF THE KANSAS ENTOMOLOGICAL SOCIETY

A quarterly journal published in January, April, July and October devoted to Entomology in the Western Mississippi Basin and the proceedings of the Kansas Entomological Society.

Manuscripts for publication may be sent to any of the publication committee.

The Kansas Entomological Society does not make exchanges since the Society does not maintain a library.

Subscription to the Journal must be paid in advance. The subscription rate is so low that second notices are not ordinarily sent out.

Payment of Canadian or other foreign subscriptions and bills must be made by international Postal Money Order or by a draft on a New York bank and payable in U.S.A. dollars.

Subscribers are urged to give us their full cooperation in these matters.

Subscriptions should be sent to Donald A. Wilbur, Department of Entomology, Kansas State College, Manhattan, Kansas.

Subscriptions in the U.S.A.,	\$2.00 per year	Single Copy
Canadian or foreign subscriptions,	2.25 per year	75 cents

KANSAS ENTOMOLOGICAL SOCIETY

President, H. H. Walkden, Hutchinson, Kansas

Vice-president, Paul B. Lawson, Lawrence, Kansas

Secretary-Treasurer, Donald A. Wilbur, Manhattan, Kansas

Vol. 19, No. 1, January, 1946

This issue mailed March 15

THE GENUS *STENOCRANUS* IN AMERICA NORTH OF MEXICO

(Homoptera-Fulgoridae-Delphacinae)

R. H. BEAMER*

The genus *Stenocranus* Fieber, as listed for this region by Z. P. Metcalf (General Cat. of Hemip., Fasc. IV, Fulgoroidea, Pt. 3, Araeopidae), contains the following species: *arundineus* Metcalf, *dorsalis* Fitch, *felti* Van D., *lautus* Van D., *luteivitta* Walker, *similis* Crawford and *unipunctatus* Prov. All of the above, as well as five new species, are included in this paper except *luteivitta* Walker which, judging from descriptions and drawings of the type in the British Museum by W. E. China, does not belong in *Stenocranus*. All photographs were made at one magnification.

The author wishes to express his appreciation for the assistance given by the following people and institutions: Doctor Z. P. Metcalf of Raleigh, North Carolina, for the identification of his species *S. arundineus*; Doctor E. C. Van Dyke of the California Academy of Science for the exchange of paratypes of *S. felti* Van D.; Doctor K. F. Chamberlain of the New York State Museum for the dissection and comparison of Fitch's type of *S. dorsalis* with specimens sent him; Doctor W. E. China of the British Museum for drawings and comments on the type of *luteivitta* Walker; Doctor L. D. Tuthill of Iowa State College for the privilege of studying a male cotype of *S. lautus* Van D.; Doctor John L. Caldwell of the United States Bureau of Entomology and Plant Quarantine for comparing dissected specimens with the type of *S. similis* Craw., and Messrs. Rainville and Comeau of the Museum of the Province of Quebec, Quebec, Canada, for the comparison of specimens with *S. unipunctatus* Prov.

Genus *Stenocranus* Fieber

Stenocranus Fieber, Verh. zool.-bot. Ges. Wien, XVI, p. 519 (1866), type *minutus* (Fabr.).

Rather slender insects of moderate size; head plus eyes narrower than pronotum; antennae terete, first segment about as long as wide; front long and narrow, slightly narrowed at base, with a small median carina divided on vertex near anterior margin of eyes; vertex longer than wide, carinae definite; lateral carinae of pronotum slightly curved in at base, reaching hind margin; spur on base of hind tibia triangular, rather thick with black spines along one margin.

* Contribution from the Department of Entomology, University of Kansas, Lawrence, Kansas.

Key to the Species of *Stenocranus*

1. M_1 and M_2 usually stemming from R in the front wing 10
 M_1 and M_2 usually not stemming from R in the front wing 2
2. Anteriolateral fovea of vertex light in color 3
 Anteriolateral fovea of vertex black in color 4
3. Elytra practically without dark markings *arundineus* Metcalf
 Elytra with some dark markings *felti* Van Duzee
4. Black spot on mesal margin of elytra near outer third *similis* Crawford
 Without black spot on mesal margin of elytra 5
5. M_2 branched in front wing *ramosus* n. sp.
 M_2 not branched in front wing 6
6. M_2 almost straight, scarcely curved to costal margin 7
 M_2 strongly curved to costal margin 9
7. Venter of genital segment almost black *dorsalis* Fitch
 Venter of genital segment very light brown or white 8
8. Venter of genital segment usually light brown; usually without an orange band on outer margin of eye; process of aedeagus angularly bifid *pallidus* n. sp.
 Venter of genital segment white; with an orange band on outer margin of eye; process of aedeagus smoothly bifid *delicatus* n. sp.
9. Subcosta usually with a black spot; aedeagal process not bifid *lautus* Van Duzee
 Subcosta usually without a black spot; aedeagal process bifid *unipunctatus* Prov.
10. Usually 5 mm. or more in length 11
 Usually distinctly less than 5 mm. in length 12
11. Subcosta usually with a black spot; process of aedeagus not forked at apex *lautus* Van Duzee
 Subcosta usually without a black spot; process of aedeagus forked at apex *unipunctatus* Prov.
12. Vertex definitely narrowed apically, extending about one-third its length beyond eye *acutus* n. sp.
 Vertex not so definitely narrowed, not extending one-third its length beyond the eye *brunneus* n. sp.

1. *Stenocranus dorsalis* (Fitch)

Delphax dorsalis Fitch, Asa Cat. Homop. 46, 1851

Resembling *S. minutus* (Fabr.) but much larger and with less dark on outer portions of elytra. Length 6.5-7.5 mm.

Front three times as long as greatest width, slightly narrowed on basal third, sharply tricarinate longitudinally, infuscated either side median ridge; vertex slightly less than twice as long as basal width, median carina both broad and side, anteriolateral fovea black; elytra broad, almost twice as long as the body, M_1 and M_2 not stemming from R.

General color stramineous with pale median dorsal line slightly darker on each side across pronotum; elytra semihyaline, veins light, small black spot on

crossveins near base of M_1 , area between M and subcosta usually slightly embrowned. Venter of male stramineous with genital segment black, of female, same color with pygofer pear-shaped and dark brown.

Genitalia: In lateral view anal segment very large with two ventrally projecting hooks with the left hook usually much smaller than the right; aedeagus long and narrow, widest at base, surrounded on basal two-thirds by a process which is enlarged at middle, rapidly narrowed on apical third, flattened and curved ventrally almost into a half circle at apex; styles S-shaped, tapered to apex.

This description was made from a homotype male, one of many from Fryeburg, Me. The dissection and comparison of the type of *S. dorsalis* Fitch with the above specimen was made by K. F. Chamberlain of the New York State Museum, Albany, N.Y.

2. *Stenocranus ramosus* n. sp

Resembling *S. dorsalis* Fitch but much smaller. M_1 , M_2 and M_3 from same stem and with much more dark coloring in outer half of elytra. Length 5-6.5 mm.

Front slightly more than three times as long as greatest width, slightly narrowed on basal third, tricarinated with a black line either side of middle carina; vertex about twice as long as basal width, at apex median carina high and wide, practically no carina evident at this point; elytra with M not stemming from R and M_1 , M_2 and M_3 stemming together.

General color stramineous with a median longitudinal light stripe, and a narrow orange band on anterior edge of eye extending across face. Elytra semihyaline with dark spot on crossveins in region of base of M_1 and all of these apical veins more or less infuscated with the heaviest coloring in area of M_1 and subcosta.

Genitalia: Male genitalia in lateral view much as in *dorsalis* but left anal hook shorter and heavier, aedeagus more sinuate and style somewhat narrower basally and more definitely curved anteriorly with a sharp spine near middle on inner margin.

Holotype ♂, allotype ♀ and 2 ♀ paratypes, Tifton, Ga., Aug. 11, 1939, R. H. Beamer; other paratypes: 1 ♂, Hilliard, Fla., Aug. 19, 1930, P. W. Oman; 1 ♀, same place, Aug. 6, 1939, R. H. Beamer; 1 ♂ and 1 ♀, Hilliard, Fla., Oct. 5, 1938, P. W. Oman; 1 ♀, south of Naples, Fla., Oct. 9, 1938, P. W. Oman; 1 ♂, Raleigh, N.C., Oct. 16, 1938, P. W. Oman; 1 ♀, Argyle, Fla., Dec. 31, 1931, P. W. Oman.

Types and paratypes in the Snow Entomological Collections; paratypes in the United States National Museum.

3. *Stenocranus pallidus* n. sp.

Resembling *S. dorsalis* but much smaller, male genital segment but slightly embrowned and the process about the aedeagus with an angular bifid apex. Length 4.75-5.75 mm.

Front slightly less than three times as long as greatest width, slightly narrowed on basal third, sharply tricarinate with black line either side median

carina; vertex about one-fifth longer than basal width, anteriolateral fovea black; elytra with sides almost parallel extending about half their length beyond the body, M_1 and M_2 not stemming from R, M_{3+4} united, straight.

General color stramineous with pale median dorsal line; elytra semihyaline, veins and area of M_{3+4} and subcosta somewhat embrowned; last ventral segment of male slightly embrowned; pygofer of female pyriform, light brown in color.

Genitalia: In lateral view anal segment large with two medium sized, ventrally projecting processes of about the same length; aedeagus long and narrow, almost straight, slightly tapering from base to twisting apex, with a broad-based process about two-thirds as long as shaft, sharply narrowed on outer third into an angular bifid apex; styles broad on basal half with rather heavy spines near middle, sharply contracted at middle to sharp sinuate apices.

Holotype ♂, allotype ♀, 5 ♂ and 58 ♀ paratypes, East Troy, Wis., Aug. 10, 1935, P. B. Lawson; other paratypes: 4 ♂♂ and 6 ♀♀, Loda, Ill., Nov. 3, 1931, H. H. Ross. Types in the Snow Entomological Collections; paratypes in Illinois Natural History Survey, Urbana, Ill.

4. *Stenocranus delicatus* n. sp.

Resembling *S. pallidus* but eyes margined with orange and process of aedeagus longer, with a smoothly curved Y-shaped apex. Length 5.5-6 mm.

Front slightly more than three times as long as greatest width, widest near middle, slightly narrowed either way from middle, moderately tricarinate longitudinally with black stripe either side of middle; vertex about one-third longer than basal width, anteriolateral fovea black; elytra with sides widest slightly beyond middle, extending about half their length beyond the body, M_1 and M_2 not stemming from R. M_{3+4} united, almost straight.

General color stramineous with pale median dorsal line, bordered with orange across pronotum, around margin of eyes and across sides of face; elytra semihyaline, veins, area of M_{3+4} and subcosta embrowned; last ventral segment of male very light; pygofer of female pyriform, light in color.

Genitalia: In lateral view anal segment large with two large ventrally projecting processes of about equal size, slightly curving caudally; aedeagus long and narrow, widest at base, narrowed from base to tip with a radical curve near basal third; process almost as long as shaft of aedeagus partially enclosing aedeagal shaft on basal third, narrowed on outer third to about basal width of aedeagal shaft, divided smoothly Y-shaped at apex; styles gradually constricted at middle and sinuate on outer third.

Holotype ♂, allotype ♀, Douglas Co., Kans., Oct. 26, 1944, R. H. Beamer; paratypes: same place and collector, 4 ♂♂ and 3 ♀♀, Oct. 19, 1944; 4 ♂♂, Nov. 2, 1944; 1 ♀, Aug. 9, 1944; 1 ♂, Oct. 15, 1926; 1 pair, Aug. 17, 1944; 1 ♀, Aug. 9, 1944; 1 ♂, Lawrence, Kans., Sept. 4, 1944, R. H. Beamer; 4 ♂♂ and 7 ♀♀, same place, June, trap light, P. B. Lawson; 1 pair, Sand Dunes, Medora, Kans., July, 1930, D. A. Wilbur; 1 ♂, Riley Co., Kans., Sept. 20, 1929, D. A. Wilbur; 7 ♂♂ and 8 ♀♀, Conway Springs, Kans., July 6, 1944, B. Guntert; 4 ♀♀, Antioch, Ill., July 26, 1934, DeLong and Ross; 2 ♂♂, Vienna, Ill.,

June 14, 1934, DeLong and Ross; numerous specimens of both sexes, Douglas Co., Kans., Aug. 30, 1945, R. H. Beamer.

Types in the Snow Entomological Collections; paratypes in United States National Museum and Illinois Natural History Survey, Urbana, Ill.

5. *Stenocranus unipunctatus* (Prov.)

Delphax unipunctata Provancher. Nat. Canadian 4: 319, 1872.

Resembling *S. lautus* but usually without a small dark spot on subcosta and aedeagal process bifid. Length 4.5-5.5 mm.

Front about two and one-half times as long as greatest width, sides almost parallel on outer two-thirds, slightly narrowed basally, tricarinate longitudinally with broad, dark band either side median carina; vertex slightly less than one-third longer than basal width, anteriolateral fovea black; elytra broad, sides almost parallel, apex slightly narrowed, extending about one-third their length beyond abdomen, M_1 and M_2 quite variable in union with R. In some specimens one wing may have M stemming from R and in the other wing they may be separated. In any case, M_2 curves distinctly toward costa.

General color stramineous with white mid-dorsal line bordered on each side by more or less orange line which extends across inner margin of eye and across sides of face; elytra semihyaline, often with most of longitudinal veins darker and usually most of area beyond crossveins heavily infuscated except dark spot on subcosta usually absent; pygofer of female and genital capsule of male brown, body segments more or less infuscated with margins lighter.

Genitalia: In lateral view anal segment greatly enlarged with a pair of ventrally projecting processes, the right one definitely shorter than left; aedeagus very long and slender, widest at base, gradually narrowed to apex with an S curve on basal half; aedeagal process almost as long as aedeagus, widest at base, apparently enclosing aedeagal shaft on basal two-thirds, narrowed to bifid apex, one point recurved; styles broad at base, narrowed and sinuate on apical half, mesal shoulder quite rounded.

This species was placed in synonymy in 1912 under *S. dorsalis* Fitch by E. P. Van Duzee. Here it has remained until a comparison of accurately determined specimens of *S. dorsalis* Fitch with the Provancher type revealed it to be a distinct species.

Specimens of this species were compared with Provancher's type in the Museum of the Province of Quebec, Quebec, Canada, through the director, Mr. Paul Rainville, by Mr. Noel M. Comeau, zoologist of the Museum. I am deeply indebted to these gentlemen for their co-operation.

6. *Stenocranus brunneus* n. sp.

Resembles *S. unipunctatus* but much shorter, darker in color and process of aedeagus without a bifid apex. Length 3.5-4.5 mm.

Front three times as long as greatest width, widest near middle, very slightly narrowed toward apex, a little more so toward base, strongly tricarinate longitudinally, wide black stripe either side median carina; vertex at least twice as long as basal width, anteriolateral fovea black; elytra with

sides almost parallel, apices rounded, extending about one-third length beyond body; M_1 and M_2 usually stemming from R, curving to costa.

General color very dark with white median dorsal line; elytra more than half embrowned, those of the females more nearly hyaline than those of the males; veins dark except along costal margin including subcosta; body red to almost fuscous; pygofer of female and male genital segment very dark brown.

Genitalia: In lateral view anal segment very large, with two ventrally projecting processes, the right about half as long as the left; aedeagus very long and narrow, broadest at base, tapered from base to apex, abruptly curved on basal half; aedeagal process as long as aedeagus, almost three times as wide at middle as at base, narrowed sword-like on outer fourth; styles broad at base, mesal shoulders sharply rectangular, apices sinuate.

Holotype ♂, Douglas Co., Kans., June 24, 1930, P. B. Lawson, trap light; allotype ♀, 8 ♂ and 16 ♀ paratypes, Douglas Co., Kans., Oct. 18, 1944, R. H. Beamer; other paratypes: same place and collector, 5 ♂♂ and 7 ♀♀, Oct. 24, 1944; 1 ♂ and 5 ♀♀, Oct. 19, 1944; 2 pairs, July 13, 1944; 21 ♂♂ and 27 ♀♀, Oct. 15, 1945; 13 ♂♂ and 8 ♀♀, Oct. 3, 1945; 1 ♂, Aug. 30, 1945; 5 ♂♂ and 2 ♀♀, Shawneetown, Ill., June 24, 1936, DeLong and Ross; 4 ♂♂, Temple Hill, Ill., June 24, 1936, DeLong and Ross; 2 ♀♀, Herod, Ill., June 24, 1936, DeLong and Ross.

Types in the Snow Entomological Collections; paratypes in the Illinois Natural History Survey, Urbana, Ill.

7. *Stenocranus acutus* n. sp.

Resembling *S. brunneus* but much more slender, with sharper vertex extending one-third its length beyond the eye. Length 4-5 mm.

Front about three times as long as greatest width, sides almost parallel on apical two-thirds, slightly narrowing on basal third, moderately tricarinate longitudinally, with broad black stripe either side middle carina; vertex almost three times as long as basal width, anteriolateral fovea black; elytra very long and narrow, heavily embrowned beyond crossveins, including a spot on subcosta; M_1 and M_2 stemming from R, M_2 curving into costa.

General color very dark, with white median dorsal line; elytra more than half brown in both sexes, color following the veins even to a sizable spot on subcosta.

Genitalia: In lateral view anal segment large, with two ventrally projecting processes, the right shorter than the left; aedeagus long and narrow, widest at base, tapered to tip with about a right angle bend on basal third; aedeagal process long and narrow, almost as long as aedeagus, slightly widened on middle third and ending in a narrowed sword-shaped tip; styles rather long and narrow with sharp constriction on apical fourth, this portion curving dorsally in ventral view, mesal shoulder less than a right angle.

Holotype ♂, allotype ♀, and one pair of paratypes, Okefenoke Swamp, Ga., July 25, 1939, R. H. Beamer; other paratypes: one pair, same place and date, D. Elmo Hardy; 1 ♂, Okefenoke Swamp, Ga., Billy's Island, July 27, 1939, R. H. Beamer; one pair, Tifton, Ga., Aug. 11, 1939, R. H. Beamer; 1 ♀, St.

Mary's River, Fla., Aug. 5, 1939, J. D. Beamer; 1 ♂ and 2 ♀♀, Hilliard, Fla., Aug. 1930, R. H. Beamer; 1 ♂, Benson, N.C., Aug. 9, 1934, R. H. Beamer; 1 ♀, Atlanta, Ga., Aug. 2, 1913, R. H. Beamer; 1 ♂, Orange Grove, Miss., July 10, 1934, R. H. Beamer; 3 ♂♂, Raleigh, N.C., Oct. 16, 1938, P. W. Oman; 1 ♀, Hilliard, Fla., Oct. 5, 1938, P. W. Oman, 1 ♀, New Port Ritchey, Fla., Oct. 7, 1938, P. W. Oman.

Types and paratypes in the Snow Entomological Collections; paratypes in the United States National Museum.

8. *Stenocranus lautus* Van Duzee

Resembling *S. brunneus* but larger, usually with fewer dark markings and male styles in lateral view much longer and more slender. Length 5-6 mm.

Front about two and a half times as long as greatest width, sides almost parallel on apical two-thirds, slightly narrowed on basal third, definitely tricarinate longitudinally, with a black stripe either side median carina; vertex about three times as long as basal width, anteriolateral fovea black; elytra usually widest almost at apex, very long, with sides almost parallel, projecting about half their length beyond abdomen, M_1 and M_2 usually stemming from R but sometimes they are both free; M_2 curving to costa.

General color brownish fuscous, with white median dorsal line, elytra often more than half brown, at least the veins dark, except costa and subcosta, the latter with a small black spot at tip.

Genitalia: In lateral view anal segment large, with two long ventrally projecting processes, the right one about half as long as the left, aedeagus very long and narrow, widest at base, tapering to tip, with right angle bend beyond basal third; aedeagal process straight, slightly shorter than aedeagal shaft, widest near base, with apex turned slightly laterally and flattened; styles very long and slender, sinuately curved and narrowed on outer half, in ventral view mesal shoulder broadly rounded.

Redescribed from the cotype male taken "by Doctor E. B. Southwick near New York City" and here designated lectotype. This specimen was studied through the courtesy of Iowa State College, Ames, Iowa, and is in their collection. Specimens of this species are at hand from the following states: Kansas, Illinois, North Carolina, Washington, D.C., Virginia, Maryland, and New Hampshire.

9. *Stenocranus similis* Crawford

Stenocranus similis Crawford, David L., Proc. U S N M., Vol. 46, p. 590.

Resembling *S. dorsalis* but smaller and with many dark markings on the dorsum. Length 4.5-6 mm.

Front slightly less than three times as long as broad, longitudinally tricarinate, with a dark stripe either side median carina; vertex about one-fifth longer than basal width, anteriolateral fovea black; elytra widest in region of crossveins with apex broadly rounded, about one-third longer than body, veins prominent; M_1 and M_2 not stemming from R, slightly curved toward costa.

General color quite dark, median longitudinal white line very narrow,

almost wanting; elytra mostly infusated, with a darker spot on mesal margin at outer end of claval veins.

Genitalia: In lateral view anal segment very large, with a pair of ventrally projecting hooks; aedeagus very long and narrow, widest at base, narrowed to bent tip; aedeagal process about twice as wide on basal two-thirds as aedeagus at base, narrowed on outer third to less than fifth basal width and divided into three tips of unequal length; a second process just dorsal to the first, about two-thirds as long and about as wide as aedeagus; styles in lateral view almost straight to a dorsally bent apex, sides of outer half gradually narrowed; in ventral view sides of basal two-thirds almost parallel, outer third sharply constricted to slender curved apices.

Redescribed from specimens from Benton, Ky., which were compared with Crawford's type by Doctor J. S. Caldwell, United States Bureau of Entomology and Plant Quarantine.

10. *Stenocranus arundineus* Metcalf

Stenocranus arundineus Metcalf, Z. P., Jour. Elisha Mitchell Soc., Vol. 38, p. 197, 1923

Resembling *S. dorsalis* but without any black markings. Length 6-8 mm. Front about three and one-half times as long as greatest width, sides almost parallel, slightly narrowed near base, strongly, longitudinally tricarinate, without black stripe either side median carina; vertex but slightly longer than basal width, anteriolateral fovea light; elytra widest at or beyond the crossveins, apices broadly rounded, extending about half their length beyond the abdomen; M_1 and M_2 not stemming from R, M_2 extending straight to costa.

General color buff, with usual light median dorsal line bordered on pronotum with orange, vertex and front also tinged with orange, no dark on body or elytra except tiny spot at tip of beak.

Genitalia: In lateral view anal segment very large with two ventrally projecting processes on each side; aedeagus very long and narrow, broadest at base, gradually narrowed to apex; aedeagal process about three times as broad at base as base of aedeagus, tapered to sharp apex, about one-third shorter than aedeagus; styles broadest at base, slightly narrowed at basal third and again more radically so on outer third, curved slightly dorsally throughout.

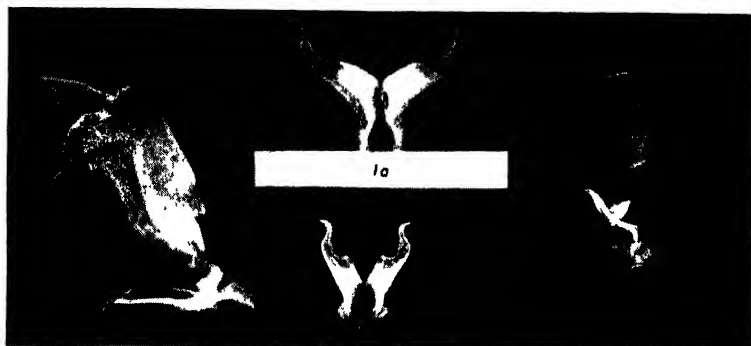
Numerous specimens at hand, swept from *Arundinaria* in Georgia and North Carolina.

11. *Stenocranus felti* Van D.

Stenocranus felti Van Duzee, E. P., Trans. Amer. Ent. Soc., Vol. 36, p. 88, 1910.

Resembling *S. dorsalis* but much smaller, elytra flaring with apices rapidly, narrowing beyond crossveins and anteriolateral fovea of vertex not black. Length 4-5 mm.

Front slightly more than twice as long as widest portion which is near the middle, narrowed very slightly toward apex and a little more toward base, moderately tricarinate longitudinally, slightly embrowned between the carina but not black; vertex about one-third longer than basal width, anteriolateral fovea not or scarcely darkened; elytra broad for their width, almost parallel



1. *S. dorsalis*

2a

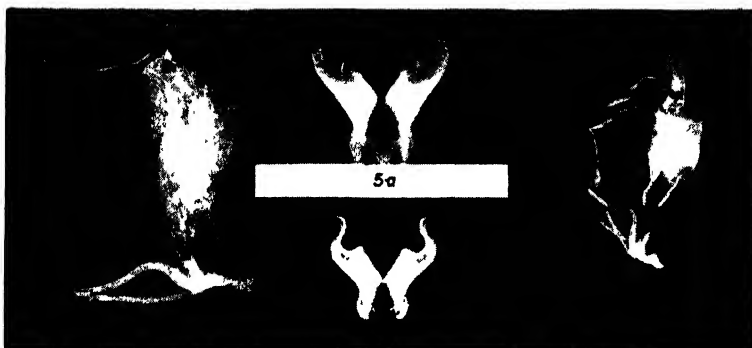
2. *S. ramosus*



3. *S. pallidus*

4a

4. *S. delicatus*



5. *S. unipunctatus*

6a

6. *S. bruneus*

EXPLANATION OF PLATES

The plates contain the lateral view of the anal segment, the aedeagus and its process of each species and the ventral view of the styles of each species.

sided, sharply narrowed beyond crossveins; M_1 and M_2 not stemming from R, curved to costa.

General color buff with a rather broad median white line, bordered on

7. *S. acutus*

8a

8. *S. lautus*9. *S. similis*

9a

10. *S. arundineus*

10a

11. *S. feia*

11a

pronotum with orange; elytra semihyaline with veins darker; legs linneate with fuscous.

Genitalia: In lateral view anal segment very large with a pair of short ventrally projecting, blunt, bifid processes; aedeagus long and slender, widest at base, narrowed to bent tip; aedeagal process with basal width five times that of aedeagus, about two-thirds as long as aedeagus, narrowed into a diagrammatic, avecephaliform apex; styles very broad at base, narrowed from both sides on outer third to very narrow, slightly curving apices; in ventral view widest at base, narrowed throughout to an avecephaliform outer half, with a long, slender, upcurved beak.

Redescribed from a pair of paratypes kindly exchanged by the California Academy of Science with the Snow Collections. Specimens at hand from Wisconsin, Minnesota, New Hampshire, and Manitoba, Canada.

ADDITIONAL HOST AND DISTRIBUTION RECORDS OF THE SWEETPOTATO LEAF BEETLE, *TYPOPHORUS* *VIRIDICYANEUS* (CROTCH), (COLEOPTERA, CHRYSOMELIDAE).¹

RALPH L. PARKER

Kansas Agricultural Experiment Station,
Manhattan, Kansas

Recently the sweetpotato leaf beetle was found doing considerable damage to sweetpotato plants in the vicinity of Oxford, Sumner County, Kansas. Dr. H. B. Hungerford (1945)² published in the October issue of the Journal of the Kansas Entomological Society a short article in regard to the finding of this insect which caused considerable damage to sweetpotato tubers. He gave the distribution of this insect in Kansas and other states. He suggested that the additional information assembled by the author be published.

Hungerford (1945) gave the distribution in Kansas as follows: Douglas, Johnson, Neosho, and Sumner Counties. Additional localities are as follows:

Leavenworth County, Kansas, June 11, 1921, I. N. Chapman,
10 specimens, dock.

Marion, Marion County, Kansas, June 7, 1926, E. C. Smith
(Student Collections), 2 specimens.

Frankfort, Marshall County, Kansas, June 15, 1926, W. Wullschlegel
(Student Collections), 4 specimens.

Onaga, Pottawatomie County, Kansas, no date given,
F. F. Crevecoeur, 2 specimens.

Onaga, Pottawatomie County, Kansas, June 30, 1922,
F. F. Crevecoeur, 1 specimen.

Onaga, Pottawatomie County, Kansas, June 25, 1929,
F. F. Crevecoeur, 1 specimen.

¹ Contribution No. 545, Department of Entomology.

² Literature cited.

- Manhattan, Riley County, Kansas, no date given, E. A. Popenoe, 1 specimen.
- Manhattan, Riley County, Kansas, July 17, 1892, E. A. Popenoe, 1 specimen.
- Manhattan, Riley County, Kansas, July 26, 1892, E. A. Popenoe, 1 specimen.
- Manhattan, Riley County, Kansas, no date given, F. Marlatt, 1 specimen.
- Manhattan, Riley County, Kansas, June, F. Marlatt, 1 specimen.
- Manhattan, Riley County, Kansas, July 19, 1940, Roger C. Smith, 4 specimens, field bindweed.
- Topeka, Shawnee County, Kansas, July, E. A. Popenoe, 3 specimens.
- Sumner County, Kansas, June 19, 1905, M. L. Briggles, 10 specimens.

In the Warren Knaus Collection there is an additional state record as follows:

- White Sulphur Springs, West Virginia, Aug. 8, 1915,
W. Robinson, 4 specimens.

Crotch (1873) first recorded this insect attacking sweetpotatoes and described it in 1873 as *Paria viridicyanea*. He gave for the distribution in the United States, the Middle and Southern States, and also Mexico. Chittenden (1925) listed the states of North Carolina, South Carolina, Arkansas, Mississippi, and Texas. Brannon (1938) listed the additional states of Maryland, Virginia, Kentucky, Tennessee, Georgia, and Alabama. Leng (1920) listed the additional states of Florida, Indiana, and Southern California. Hungerford (1945) listed as new distribution records, the states of Iowa, Pennsylvania, Kansas, and New Mexico. Professor Dwight Isely, University of Arkansas, Fayetteville, in a letter stated that it is found commonly in the western part of Arkansas and particularly in the northwestern region. Dr. F. A. Fenton, Oklahoma Agricultural and Mechanical College, Stillwater, also in a letter stated that it is found in Okmulgee, Delaware, Washington and Craig Counties in northeastern Oklahoma, with a range of dates of collection from June 22 to August 9.

Chittenden (1925) listed as the hosts of this insect the sweetpotato, wild sweetpotato and morning-glory or tie-vine. New hosts listed here are dock and field bindweed, *Convolvulus arvensis* L. Professor Isely reported wild Ipomea and sweetpotato as the hosts in the northwestern region of Arkansas.

Literature Cited

- Brannon, Loyd W., 1938. The Sweetpotato Leaf Beetle. U.S.D.A. Cir. 495, 9 pp.
- Chittenden, F. H., 1925. Note on the Sweet-potato Leaf-beetle and a Related Mexican Form. Bull. Brooklyn Ent. Soc. 20:91-92.
- Crotch, G. R., 1873. Materials for the Study of the Phytophaga of the United States. Acad. Nat. Sci. Phila. Proc. 25:19-83 (40).
- Hungerford, H. B., 1945. The Sweetpotato Leaf Beetle, *Typophorus viridicyaneus* (Crotch) in Kansas. Jour. Kans. Ent. Soc. 18:154-155.
- Leng, C. W., 1920. Catalogue of the Coleoptera of America, North of Mexico. John D. Sherman, Jr., Mt. Vernon, N.Y. 470 pp. (294).

EFFECT OF TEMPERATURE ON KNOCK-DOWN AND KILL OF MOSQUITOES AND BEDBUGS EXPOSED TO DDT¹

ARTHUR W. LINDQUIST, A. H. MADDEN, AND H. O. SCHROEDER,
U.S.D.A., Agr. Res. Adm., Bureau of Entomology and Plant Quarantine

Studies made to determine the effect of temperature on houseflies (*Musca domestica* L.) exposed to DDT (1-trichloro-2, 2-bis(p-chlorophenyl)ethane) (Lindquist et al. 1945) showed that knock-down was faster at 70° F. than at 100°. Because of the world-wide military use of DDT in the control of insects, and the possibility that temperatures may affect the results obtained, the following additional experiments on adult mosquitoes and bedbugs are reported.

Methods.—The technique followed in these studies was similar to that used on houseflies. Some of the insects were exposed in small cages or jars treated with DDT-kerosene solutions and the time required for knock-down at different temperatures was determined. Others were exposed for short periods (not long enough to cause knock-down) and then transferred to constant-temperature chambers for records of knock-down and 24-hour mortality. The relative humidity was kept at 60-70 per cent in all tests. For the tests with mosquitoes screen-wire cages were treated with DDT at the rate of 200 mg. per square foot, and for the tests with bedbugs glass jars were sprayed at the rate of 100 mg. per square foot.

Time Required for Knock-down of Mosquitoes.—Approximately 500 *Anopheles* mosquitoes (*A. quadrimaculatus* Say) were exposed at 70°, 80°, 90°, and 100° F. in a screen-wire cage treated with DDT 3 to 4 weeks previously. The time required for complete knock-down at the respective temperatures (average of 4 tests) was 140, 138, 116, and 28 minutes. Contrary to the results obtained with houseflies, the knock-down was faster at the higher temperatures. With few exceptions no flies or mosquitoes recovered after being prostrated from exposure to DDT.

Effect of Short Exposure on Mosquitoes.—A number of *Anopheles quadrimaculatus* adults were exposed for 15 minutes at 70° F. in a cage treated with DDT 30 to 40 days previously. These mosquitoes were then divided into three equal groups, transferred to clean cages, and held at different constant temperatures for 24 hours. A number of mosquitoes from the same lot were then exposed for 15 minutes at 95° in the same DDT-treated cage. These mosquitoes also were divided into three equal groups, which were handled exactly as those exposed at 70°. The results given in Table 1 shown that, for short intervals at least, exposure at 95° causes greater knock-down and mortality than exposure at 70°, irrespective of the temperature at which the mosquitoes are held after exposure.

¹ The data included in this manuscript were obtained in connection with investigations conducted at Orlando, Fla., under a transfer of funds, recommended by the Committee on Medical Research, between the Office of Scientific Research and Development and the Bureau of Entomology and Plant Quarantine.

Table 1.—Knock-down and kill of *Anopheles quadrimaculatus* exposed for 15 minutes at 70° and 95° F. in a DDT-treated cage and then held at different temperatures in clean cages. Average of 8 tests involving approximately 1700 insects.

Temperature		Knock-down after		Kill in 24 Hours
In DDT-treated Cage	In Clean Cage	1 Hour	6 Hours	
°F.	°F.	Per Cent	Per Cent	Per Cent
70	70	6	11	20
	80	7	7	15
	90	3	4	11
95	70	80	81	86
	80	64	44	46
	90	30	25	34

In the previous tests with houseflies there were no differences in mortality between the two exposures (5 minutes only). With mosquitoes, however, it will be noted from Table 1 that, regardless of the exposure temperature, the percentage of knock-down and kill was greatest when they were held at 70°. This is in direct agreement with results obtained on houseflies, but the reverse of knock-down results with mosquitoes continuously exposed in treated cages.

In identical tests carried out with *Culex quinquefasciatus* Say similar results were obtained, as shown in Table 2.

Table 2.—Knock-down and kill of *Culex quinquefasciatus* exposed for 15 minutes at 70° and 90° F. in a DDT-treated cage and then held at a different temperature in clean cages. Average of 7 tests involving approximately 1500 insects.

Temperature		Knock-down after		Kill in 24 Hours
In DDT-treated Cage	In Clean Cage	1 Hour	6 Hours	
°F.	°F.	Per Cent	Per Cent	Per Cent
70	70	7	13	14
	80	14	16	10
	90	6	13	8
90	70	65	34	59
	80	18	14	15
	90	3	17	18

Effect of Short Exposure on Bedbugs.—Parallel tests were conducted with bedbugs, *Cimex hemipterus* F. and *C. lectularius* L. The insects were exposed for 5 minutes at 70° F. in a glass jar sprayed with DDT 20 days previously. After exposure the bedbugs were divided into three equal groups, placed in clean jars, and held at different temperatures for 48 hours. The mortality of both species was greater when the insects were held at 70° after

exposure to the DDT than when held at 80° and 90°. No difference in mortality was apparent between holding temperatures of 80° and 90°. *C. hemipterus* was considerably more resistant to DDT than *C. lectularius*. The kill in 48 hours (average of 7 tests) at 70°, 80°, and 90° was 50, 40, and 38 percent for *Cimex hemipterus* and 83, 64, and 63 percent for *C. lectularius*.

Literature Cited

- Lindquist, A. W., H. G. Wilson, H. O. Schroeder, and A. H. Madden, 1945. Effect of temperatures on knock-down and kill of houseflies exposed to DDT. *Jour. Econ. Ent.*, 38: 261-4.

THE ERYTHRONEURA OF THE VULNERATA GROUP (Homoptera-Cicadellidae)

R. H. BEAMER*

The *vulnerata* group of the genus *Erythroneura* is the last to be considered of those keyed out by the author in *The University of Kansas Science Bulletin*, Vol. XXIV, No. 14, page 262, July 15, 1936. Fifteen old species are treated, five of which are placed in synonymy, and one is described as new. The question as to the advisability of giving the various groups of *Erythroneura* subgeneric names has often been considered. Some of the species, however, are closely related to European forms; therefore, until such time as more and correctly identified material representing European genera now considered synonyms is available, it is probably wiser to allow the genus to stand as now divided into groups.

Key to Groups of *Erythroneura*

- | | |
|---|------------------------|
| 1. M-Cu cross vein present | 2 |
| M-Cu cross vein usually absent, media and cubitus forming a more or less continuous line | 3 |
| 2. Base of cell M_1 curved; two posteriorly diverging vittae usually present on vertex and pronotum | <i>obliqua</i> group |
| Base of cell M_1 angulate; vertex and pronotum not marked as above; cross veins usually white | <i>vulnerata</i> group |
| 3. Base of cell M_1 oblique | <i>maculata</i> group |
| Base of cell M_1 square | <i>comes</i> group |

Key to Species

- | | |
|--|---|
| 1. Vertex mostly light in color | 2 |
| Vertex not mostly light in color | 5 |
| 2. Vertex broadly rounded, often with a pair of darker spots | 3 |
| Vertex more sharply angled, spots if present elongated, usually orange | <i>vulnerata</i> var. <i>gradata</i> Rob. |
| 3. Spots on vertex absent or if present usually red or pinkish | <i>calva</i> n. sp. |
| Spots on vertex dark in color | 4 |

* Contribution from the Department of Entomology, University of Kansas, Lawrence, Kansas.

4. Larger (2.9-3.46 mm.); pronotum and scutellum chiefly yellow .. *tecta* McA.
Smaller (2.64-2.97 mm.); pronotum and scutellum chiefly
dusky *carbonata* McA.
5. Color markings of dorsum mostly black 6
Color markings of dorsum not black 9
6. Vertex without a median longitudinal white line *atrata* Johns.
Vertex with a median longitudinal white line 7
7. Disk and posterior margin of pronotum usually almost white in
color *nigra* var. *decora* McA.
Disk and posterior margin of pronotum black 8
8. Vertex blunt, usually with white spots next eyes near
base *nigra* (Gill.)
Vertex definitely more acute, usually without light spots at
base next eyes *nigerrima* McA.
9. Slightly more than anterior half of dorsum dark in color,
remainder light *bicolorata* Bmr.
Evenly colored throughout 10
10. Disk of pronotum with large brown, heart-shaped mark .. *fulmina* McA.
Disk of pronotum otherwise marked 11
11. Pygofer hook short, less than half as long as pygofer
(Rocky Mts., east) *vulnerata* Fitch
Pygofer hook long, about one half as long as pygofer
(Ariz., Calif.) *variabilis* Bmr.

1. *Erythroneura vulnerata* Fitch

Erythroneura vulnerata Fitch, Asa. N.Y. State Cab Nat. Hist., pp 62-63, 1851

"Fulvous-brown spotted and lined with whitish; elytra with an abbreviated yellowish-white vitta on the outer margin, interrupted near the middle by an oblique black line, and towards the apex by an oblique sanguineous one; tips dusky, with whitish nervures and spots; a whitish medial line common to the vertex, thorax and scutel; beneath black, legs pallid. Length 0.12. On raspberry bushes, grapevines and other situations where the foliage is dense, often in great numbers. No. 819, male; 820, female."

Internal ♂ genitalia: Pygofer hook quite variable from a bifid sharp-pointed structure to a short blunt, somewhat avicephaliform, process (Fig. 1a). Style with foot of medium size; heel normal; base straight; anterior point short, slightly less than a right angle; posterior point with sides converging, usually shorter than base, forming greater than a right angle with base. Aedeagus in dorsoventral view very short and broad, composed mostly of a pair of heavy lateral processes curving slightly medianly.

The variations in the shape of the pygofer hooks of this species have presented quite a problem. All of them, however, were found in specimens swept from Boston ivy, Virginia creeper, and grape, each host taken in a separate location. Until such time as rearing data prove otherwise, it is best to consider them as variations of one species rather than as distinct forms.

This is a wide-spread species from the Rocky Mountains eastward. It is

found on many hosts and is a real pest of grape, Virginia creeper and Boston ivy.

***Erythroneura vulnerata* var. *gradata* Rob.**

***Erythroneura gradata* Robinson, W., Can. Ent., Vol LVI, No 3, p 58, 1924**

Dissections of males of *E. gradata* reveal the same variations in pygofer hooks as have been found in *vulnerata*. No specimens of this species have been taken out of the growing season and teneral specimens of *vulnerata* have been collected on many occasions which closely resemble *gradata* in color. This is fairly conclusive evidence that *gradata* is just a seasonal color variation of *vulnerata*.

2. *Erythroneura variabilis* Beamer

***Erythroneura variabilis* Beamer, R H, Annals Ent Soc Am, Vol XXII, p 126, 1929**

This species is generally a little larger than *E. vulnerata* Fitch and has about the same color and markings. It is easily separated from *E. vulnerata* by the large bifid pygofer hook which is about half as long as the pygofer, and by its western distribution. Numerous specimens are at hand from Arizona and California. This species seems to take the place of *E. vulnerata* in Arizona and Southern California.

3. *Erythroneura fulmina* McAtee

***Erythroneura vulnerata* var *fulmina* McAtee, W L Trans Amer Ent Soc, Aug 26, p 274, 1920**

***Erythroneura pulchella* Robinson, W Can Ent, Vol LVI, p 155, 1924**

Resembling *E. vulnerata* Fitch but markings darker brown, margined with red. Lighter areas milky white. The deep velvety brown color of the disk of the vertex, pronotum and basal angles of the scutellum separates this species from *E. vulnerata*.

Internal ♂ genitalia: Pygofer hook about one-third as long as pygofer and three times as long as its own width, bifid with outer point longer, inner point curving toward outer. Aedeagus as in *E. vulnerata*. Style with large foot; heel medium, base straight; anterior point short, slightly less than right angle; posterior point almost as long as base, narrow, sides converging.

Types studied in United States National Museum.

This is not a very common species. Specimens have been studied from Maryland, Illinois and Kansas.

4. *Erythroneura bicolorata* Beamer

***Erythroneura bicolorata* Beamer, R H Jour Kans Ent Soc, Vol. X, p 11, 1937**

This species resembles *E. vulnerata* but is easily separated from it by the dark anterior half of the body and the light posterior portion. The internal male genitalia show a closer relation to *E. fulmina* McA. but the above characters easily separate it from this species. This is one of the rarer species in this group, being known only from the type series.

5. *Erythroneura nigra* (Gill.)

***Thyphlocyba vulnerata* var. *niger* Gillette, C. P. Proc U.S National Museum, Vol XX, p 765, 1898**

***Thyphlocyba nigradorsum* DeLong, D. M. Bull. No 17, Tenn State Board of Ent, June, 1916, p. 110**

Resembling *E. vulnerata* but color of dorsum mostly black instead of

green or brown; aedeagus without large basal processes and with a definite shaft with three short terminal processes.

Color: Dorsum generally black with ivory to yellowish markings. Front ivory, reaching well up over margin of vertex, often connected with a pair of small ivory spots next eyes near base of vertex and with narrow median longitudinal line usually enlarged anteriorly. Pronotum usually with five ivory spots inside anterior border. Scutellum sometimes with faint median ivory line. Elytra with or without large spot near tip of scutellum; costal plaque and spot on costa just before cross veins, ivory; cross veins and usually a number of areoles at apex of clavi ivory to semihyaline.

Internal δ genitalia: Pygofer hook with sides slightly converging, bent at right angles near middle. Style with small foot; base straight, heel medium; anterior point short, slightly less than a right angle; posterior point almost half as long as base, about as thick at base as length, marginal line connecting anterior and posterior points curved outward. Aedeagus with shaft tubular, short, slightly tapered from base half way to tip; apex with three spines, one on each side and one on venter, about as long as diameter of shaft and extended at right angles to it, slightly curved.

Type \varnothing , No. 3452, in U.S. National Museum.

This is a very common form. It is often collected on various species of *Polygonum*.

Erythroneura nigra var. *decora* McA.

Erythroneura vulnerata var. *decora* McAtee W. L. Trans. Am. Ent. Soc., Vol. 46, p. 274, 1920.

Many dissections of males of *decora* McA. reveal the same characteristics as *nigra* (Gill.). The external markings are so radically different that the name is retained as a variety of *E. nigra*. The original description follows: "Color markings smoky to black, pale areas conspicuous by contrast and much larger than in variety *vulnerata*, vertex pale yellow with two broad black vittae inclosing a narrow median pale one, pronotum with median and two discal pale yellow spots, sometimes merged, spots and dashes of same color near lateral and anterior margins; median scutellar vitta broad and basal triangles paler within; tegminal pale areas large, that on base of clavus conspicuous, pale yellow; costal plaque pale yellow. Length 2.83 mm."

This is a very common form on various species of *Polygonum* and is quite variable in color.

6. *Erythroneura nigerrima* McAtee

Erythroneura vulnerata var. *nigerrima* McAtee, W. L. Trans. Am. Ent. Soc., Vol. 46, p. 275, 1920.

Erythroneura atra Johnson, Dorothy M. Bull. Ohio Biol. Survey, Vol. 39, p. 96, 1935

Resembling *E. nigra* (Gill.) but often without or almost without the light markings on the elytra, vertex much sharper, usually without light basal spots next eyes; posterior point of style as long as foot and lateral apical processes of aedeagus almost as long as shaft.

"A darker form even than variety *niger*, the pale areas on clavus being smaller, semi-hyaline and inconspicuous; in extreme examples there is only a single pale point at two-thirds length of clavus, and one on corium near it,

besides the pale yellow costal plaque and paler costal area just posterior. Length 2.64 mm."

Internal ♂ genitalia: Pygofer hook as in *E. nigra* but larger, with the bend closer to the base. Foot of style characteristic; heel large; base straight, curved to meet posterior point which is broader at base than foot at narrowest place, slightly curved in and as long as foot; anterior point barely evident. Aedeagus cylindrical, sides almost parallel, with a pair of lateral apical recurved processes two-thirds as long as shaft; tip of shaft with much shorter dorsal lip-like structure.

This is a not uncommon species with much the same distribution as *E. nigra*.

Types in the McAtee Collection, U.S. National Museum.

7. *Erythroneura atrata* Johnson

Erythroneura atrata Johnson, Dorothy M. Ohio Biol. Survey Bull. Vol. 39, p. 97, 1935

Resembling *E. nigerrima* McA. but smaller, vertex black except very broad ivory margin, and style with very large, sickle-shaped posterior point.

"Very small stout dark species. Vertex dark brown, broadly yellow bordered, the pale area extending down middle a short distance, two lateral pale spots before eyes; pronotum entirely brown but for short anteromedian pale dash; scutellum dark with suggestion of pale median vitta; elytra—clavus and corium entirely dark but for two pale spots, one at middle of clavus, the other just below it on corium; plaque bright yellow, small white area posterior to it; apical cells dark, crossveins and apical veins at tip pale, semihyaline areas at outer middle of M_1 and outer part of R_1 . Below, head and legs pale, thorax and abdomen dark.

"Length: 2.25 mm.

"Inner male genitalia: Styles very large, heel prominent, base straight, anterior point inconspicuous, posterior point very long, twice length of foot, curved in beyond heel; oedagus very short with very small lateral spines and dorsal keel; pygofer hook with heavy quadrilateral base and long heavy spine curved in, parallel-sided to tip where it is abruptly narrowed to a fine point."

Not a common species if the number of specimens in collections is any indication.

Types in the collection at Ohio State University, Columbus, Ohio.

8. *Erythroneura tecta* McAtee

Erythroneura tecta McAtee, W. L. Trans. Am. Ent. Soc., Vol. 46, p. 289, 1920

This species belongs in the *vulnerata* group of *Erythroneura* because of the wing venation of the elytra and the internal genitalia of the male which resemble those of *E. nigra* (Gill.). It may be separated from this species by the light color of the vertex, the absence of points on the foot of the style and the larger, more nearly sword-shaped, pygofer hook.

"Ground color of scutellum and anterior parts pale yellow; vertex with two round dusky spots on disc which are more or less connected with each other, with inner side of orbits, and with posterior margin by arcuate reddish markings; pronotum with an angulate brown vitta, sometimes broken up into dusky spots on each side, and two discal spots sometimes concealed

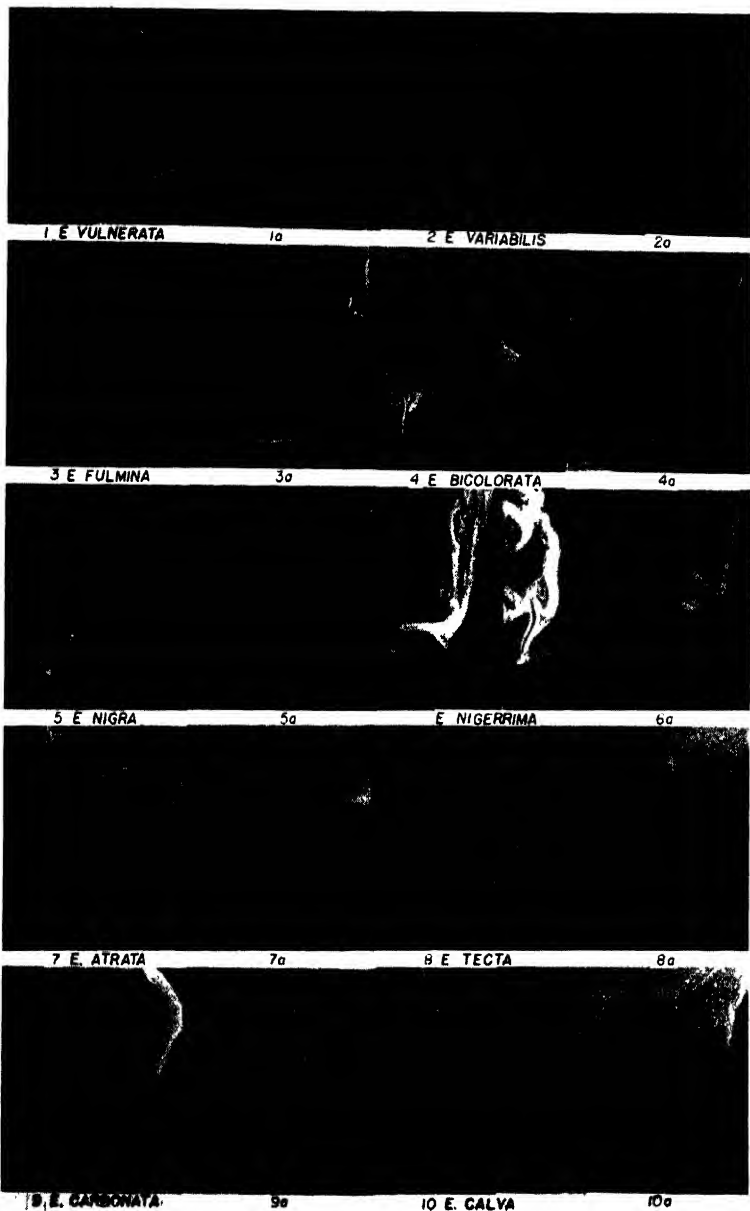
by reddish markings, which when fully developed form a U based on posterior margin; scutellum with basal triangles black, margins and apex reddish; tegmina whitish hyaline (dorsal pale areas more or less opaque); clavus is perhaps best described by saying it is red, sometimes brownish, except the whitish hyaline extreme base, a large, more opaque whitish or pale yellow area near scutellum and entirely within claval (second anal) vein a smaller whitish area overlapping apex of last but entirely outside claval vein, and a small transverse whitish band just before apex; corium more or less bluish or dusky between veins, the veins often reddish; two whitish areas bounded by red between third sector and claval suture, costal plaque pale yellow, more or less overlaid by opaque white, bounded at both ends by dusky clouds, costa hyaline posteriorly, interrupted by red cross-veins; apical cells fumose with a darker area at base of fourth cell and another at apex of wings, common to second and third cells, often forming an oblique vitta. Face pale yellowish, a dark spot on base of clypeus, two others above just within antennal bases, lower surface of vertex marked by a few reddish lines; legs pinkish livid; body slaty, or with pale yellowish edgings. Length 2.9-3 mm."

Internal ♂ genitalia. Pygofer hook more than one-third as long as pygofer, flat and slightly curved. Style with medium foot; heel small; base straight; anterior point less than a right angle, and posterior point very short. Aedeagus cylindrical, almost three times as wide at base as at tip, with a spine protruding slightly toward apex from middle of ventral margin, as long as thickness of shaft; apex of shaft with dorsal margin lip-like.

Types, in McAtee Collection in U.S. National Museum, studied along with other specimens from the type locality, from Mississippi and Illinois .

Explanation of Plate

- 1 Dorsovenral view of aedeagus and style of *E. vulnerata* Fitch
- 1a Lateral view of pygofer hooks of *E. vulnerata* Fitch, showing variation in form
- 2 Dorsovenral view of aedeagus and style of *E. variabilis* Beamer
- 2a Lateral view of pygofer hook of *E. variabilis* Beamer
- 3 Dorsovenral view of aedeagus and style of *E. fulmina* McAtee.
- 3a Lateral view of pygofer hook of *E. fulmina* McAtee
- 4 Dorsovenral view of aedeagus and style of *E. bicolorata* Beamer, aedeagus partially turned laterally
- 4a Lateral view of pygofer hook of *E. bicolorata* Beamer
- 5 Lateral view of aedeagus and dorsovenral view of style of *E. nigra* (Gill)
- 5a Lateral view of pygofer hook of *E. nigra* (Gill)
- 6 Dorsovenral view of style and lateral view of aedeagus of *E. nigerrima* McAtee
- 6a Lateral view of pygofer hook of *E. nigerrima* McAtee
- 7 Lateral view of aedeagus and dorsovenral view of style of *E. atrata* Johnson
- 7a Lateral view of pygofer hook of *E. atrata* Johnson
- 8 Dorsovenral view of style and lateral view of aedeagus of *E. tecta* McAtee
- 8a Lateral view of pygofer hook of *E. tecta* McAtee
- 9 Dorsovenral view of style and lateral view of aedeagus of *E. carbonata* McAtee
- 9a Lateral view of pygofer hook of *E. carbonata* McAtee
- 10 Dorsovenral view of style and lateral view of aedeagus of *E. calva*, n. sp.
- 10a Lateral view of pygofer hook of *E. calva*, n. sp.
(All photographs enlarged to same diameter)



9. *Erythroneura carbonata* McAtee

Erythroneura tecta var. *carbonata* McAtee, W. L. Trans. Am Ent Soc., Vol 46, p 289, 1920

Resembling *E. tecta* but pronotum and scutellum chiefly dark. Length 2.64-2.97 mm.

Color: Vertex ivory, with a pair of dusky round spots on disc, often connected with hind margin. Pronotum with a crown-shaped lighter mark on disc, remainder more or less dusky. Scutellum ivory to yellow with basal angles dark. Elytra dark with a large spot at tip of scutellum, an angular one at tip of clavi and costal plaque, ivory; some spots anterior and posterior to angular claval spot and costal margin opposite crossveins, semihyaline; crossveins light. Any of the light areas may be bordered with pink or red.

Internal ♂ genitalia: Pygofer hook almost straight with sides converging from base to apex. Style with foot medium, heel rather prominent, base slightly curved, anterior point less than a right angle, sharp, outer face of foot sloping toward heel, posterior point almost non-existent. Aedeagus cylindrical, with sides almost parallel, sharply contracted just before apex with a short, sharp spine located ventrally on the shoulder thus formed and extending almost parallel with shaft; dorsal margin of apex of shaft with a distinct curved lip.

Described from a paratype male and numerous other specimens from the type locality. Other specimens are at hand from Manitoba, Canada, and a series was taken in Cherokee County, Kansas, from *Serionema ciliatum* (L.).

Types in McAtee Collection, U.S. National Museum.

10. *Erythroneura calva* n. sp.

Resembling *E. tecta* but usually without the two black spots on vertex, and dark coloring on elytra mostly red. Length 3.25-3.5 mm.

Color: Vertex ivory with only an indication of three pinkish spots on disk, rarely an indication of tiny dark spots. Pronotum ivory with a red, anteriorly hollowed-out, spot occupying most of disk basally, more or less fuscous on sides. Scutellum ivory with semblance of dark basal angles, tip red. Elytra with longitudinal zigzag fuscous reddish stripes; large spot at tip of scutellum, another at tip of clavi, and costal plaque, ivory; tip of clavi usually pink to red; more or less hyaline areas on costal margin, at crossveins and in apical cells. Inner half of zigzag stripe usually mostly red.

Internal ♂ genitalia: Pygofer hook about one-third as long as pygofer, rather broad at base, evenly narrowed and bent ventrally into a half circle. Foot large, tapered toward toe, heel prominent, base straight, anterior point less than a right angle, face of toe sloping posteriorly inward, posterior point very short and sharp. Aedeagus cylindrical, widest at base, sharply narrowed on outer third, with an anteriorly protruding ventral spine on this shoulder extending almost to apex; dorsal margin of shaft bent in a short lip.

Holotype male, allotype female, 21 ♂ and 20 ♀ paratypes, Keld, Manitoba, Canada, Aug. 8, 1937, R. H. Beamer.

Types in the Snow Entomological Collections.

TWO NEW PARACLIUS (Diptera: Dolichopodidae)¹F. C. HARMSTON and G. F. KNOWLTON²

Collections of Dolichopodidae taken during recent years have made possible this treatment of three interesting species of *Paraclius*. Two of the species are here described as new and a key is given to aid in their separation.

Paraclius utahensis n. sp.

Male. Length, 4 mm.; length of wing, 4 mm. Face equaling the width of the base of fore femora, its sides parallel, without transverse ridge, silvery pollinose. Front concolorous with face. Antennae black; second joint with a prominent black bristle on upper edge and a few smaller hairs; third joint slightly longer than wide, rounded at tip. Arista inserted near the middle of third joint, tapering rapidly, pubescent. Lateral and inferior orbital cilia white; a strong bristle near the lower corner of the eyes, and about eight of the upper cilia are black. Palpi black with thin white pollen and black hairs on the anterior surface.

Dorsum of thorax and the scutellum metallic, dark green; pleurae subshining, the dull greenish ground color barely perceptible under the dense gray pollen. Abdomen dark green, metallic, the hind margins of segments narrowly black the lateral portions silvery pollinose; bristles arising from the posterior margins of segments black, strong. Hypopygium black, lightly dusted with silvery pollen; outer lamellae consist of a pair of black, oval disks, the apical portion broadly rounded and fringed with long, black bristles, the basal margin with delicate brownish hairs.

Coxae and legs black, lightly dusted with white pollen; the base of fore tibiae brownish. Anterior surfaces of fore and middle coxae heavily dusted with white pollen, clothed with black hairs and with the usual black bristles at tip. Middle and hind femora each with a single preapical bristle. Middle and hind tibiae with prominent bristles on posterior surfaces, the fore tibiae with about four prominent bristles on outer surface. Tarsi black, the joints of fore tarsi as 20-7-6-5-6, of middle tarsi as 25-12-10-7-7; of hind tarsi as 20-20-15-10-7. Halteres yellow; calypters brown with long brownish cilia, the latter delicate and arranged in two clumps so that they may be spread fan-like or closed to form a long pencil of hairs.

Wings grayish hyaline; costa greatly enlarged on first section, midway between the base of wing and the tip of first vein; this enlarged portion of costa is approximately the length of the cross-vein and tapers abruptly on last portion; fourth vein abruptly bent slightly beyond the middle of last section, from which point it converges strongly toward the tip of third vein, to end in wing margin well before the wing tip; cross-vein approximately the length of last section of fifth vein; posterior margin broadly incised at tip of sixth vein, forming a prominent lobe at anal angle.

¹ Contribution from the Zoology and Entomology Department, Utah State Agricultural College, Logan

² Graduate student and professor, respectively

• **Female.** Coloration as in the male; face wider, its tip broadly rounded. Wing as in the male except that the costa is much less enlarged on first section; the bend in last section of fourth vein less abrupt. Cilia of calypters coarse, less numerous than in the male.

Described from eleven males and six females, all taken at St. George, Utah, June 22, 1940 by F. C. Harmston. Holotype and allotype to be deposited in the U.S. National Museum; paratypes in the insect collections of the Utah Agricultural Experiment Station and the senior author.

Differentia. *Paraclius utahensis* n. sp. closely resembles *P. albonotatus* Lw. The resemblance is so great that the Utah specimens were identified as being *albonotatus* until material of the latter species was taken at New Smyrna, Florida in 1943 which permitted comparison. The anal angle of wing in *utahensis* forms a prominent lobe or angle, whereas in *albonotatus*, and likewise in *indianus* n. sp. the anal angle is evenly rounded and tapers gradually to the root of wing. The bristles at apex of hypopygial lamellae in *albonotatus* are long and curled or "crinkly" at tip; in the other two species these bristles are shorter and their tips are not curled or "crinkly".

***Paraclius indianus* n. sp.**

Male. Length, 4.5 mm.; length of wing, 4.5 mm. Face reaching the lower corner of eyes, narrowed on last portion, the tip rounded; a prominent transverse ridge near the middle, yellowish-gray on upper half, silvery pollinose on lower half. Palpi silvery pollinose, with black hairs and bristles on upper surface. Front bright, silvery pollinose, concolorous with lower half of face. Antennae black; first joint with scattered hairs on upper surface; second joint with a single strong bristle and several smaller hairs on upper surface; third joint scarcely longer than wide, rounded at apex. Arista inserted near the base of third joint; first portion thick, last portion tapering rapidly, pubescent. Lateral and inferior orbital cilia white; about seven of the upper cilia on each side and a prominent bristle near the lower corner of eyes are black.

Dorsum of thorax and the scutellum metallic, dark green, the central portion with violet reflections; ground color of pleurae concolorous with dorsum, heavily dusted with silvery-gray pollen. Abdomen metallic, dark green, the lower lateral portions with grayish pollen; hairs and bristles black, those on apical margins of segments particularly strong. Hypopygium large, black, lightly dusted with white pollen; outer lamellae nearly circular, black, the stem more brownish, the upper edge (morphologically lower) with prominent black bristles which are approximately the same length as the diameter of lamellae; remainder of lamellae fringed with delicate, brown hairs along the edge.

Coxae concolorous with pleurae; anterior surfaces of the fore and middle pairs densely silvery pollinose, clothed with black hairs and with the usual black bristles at the tip. Hind coxae with prominent black bristle on outer side. Femora black, in some lights with a greenish reflection which is somewhat dulled by white pollen. Middle and hind femora each with a single pre-

apical bristle. Fore and middle tibiae yellow, shading into brown toward the apices; posterior tibiae brown, the apical one-fourth black. All tibiae with conspicuous bristles. Tarsi black, the anterior basitarsus brownish at base. Joints of fore tarsi as 20-7-6-5-6; of middle tarsi as 25-13-10-7-6; of hind tarsi as 20-20-15-10-7. Halteres yellow; calypters yellow with brown tip, their cilia coarse, black, sparse.

Wings smoky gray; first section of costa greatly enlarged, so that it nearly fills the costal cell; this enlarged portion of costa is approximately the same length as middle basitarsus and its width equals the width of the middle tibia, on the last portion it tapers gradually into the costa; fourth vein with an abrupt bend near the middle of last section, from which point it converges sharply toward the tip of third vein; cross-vein at right angles to fourth vein, its length equals the last section of fifth vein; posterior margin of wing broadly incised at the tip of the fifth and sixth veins so that the anal angle, although narrowed, is somewhat rounded from the tip of sixth vein.

Female. Like the male in general coloration. Face slightly wider, wholly silvery pollinose, the transverse ridge prominent. First section of costa enlarged, but much less prominent than in the male, wing otherwise as in male.

Described from nine males and eleven females all taken at Indianapolis, Indiana, June 11, 1944 by F. C. Harmston. Holotype and allotype to be deposited in the U.S. National Museum; paratypes in the insect collections of the Utah Agricultural Experiment Station and the senior author.

Differentia. *Paraclius indianus* n. sp. closely resembles *P. utahensis* n. sp. and *P. albonotatus* Lw. The three species are alike in possessing black femora, greatly enlarged first portion of costal vein and white orbital cilia. *Indianus* differs from both in possessing a prominent transverse ridge near the middle of face and in having the face yellowish-gray on the upper half, whereas *utahensis* and *albonotatus* have face wholly silvery pollinose and without trace of a transverse ridge. The enlarged portion of costa in *indianus* is nearly twice the length of the enlarged costal section in the other two species and tapers gradually on the apical portion; in both *utahensis* and *albonotatus* the thickened section of costa is rather abrupt at tip.

The following key will serve to separate the males of the three species:

1. Face with prominent transverse ridge near the middle; grayish-yellow on upper portion, silvery pollinose on lower half; cilia of calypters black, coarse, sparse **indianus n. sp.**
 Face without prominent transverse ridge, silvery pollinose; cilia of calypters delicate, brownish 2
2. Anal angle of wing evenly rounded, tapering gradually into root of wing; bristles of hypopygial lamellae long and "crinkly" at tips **albonotatus Lw.**
 Anal angle of wing with prominent lobe; bristles of lamellae shorter, their tips plain **utahensis n. sp.**

POPULATION STUDIES ON *COCHLIOMYIA AMERICANA*
IN ARIZONACHRISTIAN C. DEONIER¹

U S D A , Agr Res Adm , Bureau of Entomology and Plant Quarantine

Very little has been known regarding variations of the distribution of the screwworm (*Cochliomyia americana* C. and P.) within a small area, or the amount of shifting of population that occurs with changes in ecological factors. In many localities in Arizona the changes in some of these factors, such as elevation and plant association, are so great within relatively small areas that studies were initiated to obtain data on the relationship between various environmental factors and the population of *C. americana*. Parman (2) has discussed the broader aspects of adult populations as influenced by weather conditions. Studies made during the summer and fall of 1938 at Somerton, Tempe, Wickenburg, Sonoita, and Nogales are reported herein.

Many ranchers had reported differences in severity of screwworm attack in different ranges on the same ranch. They learned which ranges were likely to have the most infestations under various ecological conditions and thus require careful inspection. Since these differences could not be attributed to variations in hosts or ranch management, it was obvious that the screwworm fly was influenced in its activity by environmental differences within a small area.

Traps and Bait.—All-metal, cone-type traps were used in these tests. Each trap was baited with 2 pounds of liver and 1½ gallons of water, and designated by the name of the town near which it was located.

Trap Locations.—The areas studied were all in southern Arizona and varied in ecological conditions from irrigated valley and semidesert to desert grass and oak woodland, with elevations from 125 feet at Somerton to over 5,000 feet on the range on the east slope of the Santa Rita Mountains. The normal annual rainfall in these areas ranges from 3.71 inches near Somerton to approximately 18 inches in the Sonoita area. The mean monthly temperatures reach 90° F. at Yuma in August and drop to below 60° in December. At Tempe and Wickenburg the temperatures are 5° to 10° cooler, and at Nogales 10° to 15° cooler, than the mean temperatures at Yuma.

Three traps were used at each location. They were arranged in a triangle, approximately 3 miles apart. This distance between the traps was chosen arbitrarily because of convenience of local conditions, and because it was considered a distance at which traps would have little influence on each other. With the triangular arrangement it was believed that if the distance between traps was not sufficient to prevent a trap from affecting an adjacent area, each trap might tend to be influenced equally by the other traps. All the traps were in partial shade.

At Somerton (elevation 125 ft.) trap 1 was placed on the edge of an alfalfa field in which sheep were pastured periodically, and adjacent to a hospital pen

¹ The writer expresses his appreciation for the suggestions and criticisms made by D. C. Parman

where 20 or more "wormies" (infested animals) were kept; trap 2 in a young pecan grove which was interplanted with sweetclover, and where sheep were on pasture during the time the trap was in operation; and trap 3 on the edge of an alfalfa field with no animals in the vicinity, except for a herd of dairy cattle which was not near the traps while they were in operation.

At Tempe (elevation 165 ft) all the traps were placed on dairy ranches in an irrigated valley. Owing to local conditions trap 3 was placed slightly more than 3 miles from the other two traps. The populations of sheep and feeder cattle in this area are seasonal, with the influx beginning in the fall.

At Wickenburg (elevation 2,100 ft) traps 1 and 2 were located on the Hassayampa River, where the moisture conditions and wooded environs were favorable for blowfly survival, and trap 3 was located on the desert. A limited number of cattle were present along the river. The sheep population was seasonal.

At Sonoita (elevation approximately 4,500 to 5,000 ft.) the traps were located on a large cattle ranch between the Santa Rita and Whetstone Mountains. Each trap was located at a stock-watering place. Trap 1 was in a mesquite draw that sloped back toward the Santa Rita Mountains; trap 2 at a still higher elevation in an oak environment with rarely a low scrubby mesquite; and trap 3 in a valley near a flowing stream where mesquite growth was dense.

At Nogales (elevation 3,600 to over 4,000 ft.) trap 1 was located on Nogales Creek 1 mile above where it enters the Santa Cruz River, and trap 2 was located 3 miles north on the Santa Cruz River. Trap 3 was moved about the other traps. First it was located at Tumacacori, approximately 12 miles north on the Santa Cruz River; second 3 miles east of trap 1 on the Santa Cruz River; and third on the Ruby and Bear Valley Road to the south, where it remained until the trapping was discontinued in the fall. Traps 1 and 2 were in desert grass (mesquite) environment. Trap 3, in its last location, was at a much higher elevation than traps 1 and 2 and in an area where oak woodlands were beginning to predominate in the draws.

Weather Conditions During Tests.--These tests were conducted during a cycle of years when the rainfall was below normal. The 1938 season was very droughty. Although some areas had good rainfall, the rainfall was not general, and on the whole conditions were unfavorable for a high population of *Cochliomyia americana*. However, the *C. americana* population was large enough in Arizona to infest all available wounds during the screwworm season.

Results.—The results of these tests are shown in Table 1. At Somerton it was found that extremely high temperatures will not prevent an increase in the population of *Cochliomyia americana*, if the moisture, as on irrigated lands, is favorable for their development. Furthermore, the flies were more abundant in the vicinity of their host, an area protected from the hot, dry winds and where some shade was available.

Table 1.—Summary of data on populations of *Cochliomyia americana* collected in traps in different locations in Arizona subject to various environmental factors. Three traps operated at each location. 1938.

Date Trap Emptied	Number of Females Taken		
	Trap 1	Trap 2	Trap 3
Somerton			
July 14	20	53	5
July 28	34	126	8
August 10	10	148	10
Tempe			
August 24	7	2	22
September 12	17	4	21
September 27	7	12	49
October 12	23	17	69
October 27	33	30	64
November 12	40	33	32
November 29	7	6	11
Wickenburg			
August 29	7	5	2
September 15	37	18	0
September 29	41	7	0
October 14	30	18	1
October 29	25	21	1
November 14	1	2	0
November 28	1	1	0
Sonoita			
September 7	118	5	51
September 22	112	22	44
October 7	124	3	59
October 21	38	2	111
November 4	33	0	60
November 18	3	0	1
December 1	2	0	0
Nogales			
August 22	17	34	10 ¹
September 6	20	28	79 ¹
September 21	24	65	42 ²
October 6	55	25	125 ¹
October 20	30	7	26
November 3	12	12	3
November 17	0	4	0
December 2	0	2	1

¹ At Tumacacori

² On Santa Cruz River 3 miles east of trap 1.

³ On Ruby and Bear Valley Road 3 miles from Nogales highway in this and subsequent periods.

At Tempe the ecological conditions were more uniform both as to plant association and animal host. There was no outstanding variation among the traps.

The principal point brought out by the data obtained with the Wickenburg traps was the close association of *Cochliomyia americana* along the streams in the more moist environments during periods of hot, dry weather. A similar situation was later found in Texas when a trap on the west branch of the Nueces River took 1,044 *C. americana* females in the 2 weeks ending June 28, 1939, a period of severe drought.

Local concentrations of *Cochliomyia americana* occurred in favorable areas when the surrounding areas were unfavorable owing to extreme ecological conditions. Parish and Cushing (1), in experiments conducted at Menard, Tex., before the identity of the two species of *Cochliomyia* was known, found that traps located in very light shade near a running stream or large pond, protected from direct wind and surrounded with timber and underbrush of medium density, were the most favorable.

At Sonoita the number of screwworm flies taken at the more open location at a higher elevation (trap 2) was distinctly smaller than the numbers taken in traps 1 and 3 located in the more shaded mesquite draws. This higher, open location was unfavorable for all blowflies except *Sarcophaga*. The peak catches with traps 1 and 3 occurred at different times. The data were insufficient to explain this variation.

At Nogales traps 1 and 2, which were located in similar environments, took similar catches. On September 21 trap 3 was moved to a range which was reported to have heavy infestations. The catch of 125 *Cochliomyia americana* females in the following 2 weeks was the highest obtained in the Nogales area. By this time summer rains had occurred and open ranges away from the water courses and mesquite draws were highly favorable for *C. americana*.

Summary.—Adults of *Cochliomyia americana* C. and P. are uniformly distributed over relatively small areas only when the ecological conditions are uniform. Extremely high temperatures are not a limiting factor in the development of these insects when moisture conditions are favorable. The presence of a larger fly population in the immediate vicinity of the host material is indicated. During hot, dry weather the flies in the range sections are restricted to the vicinity of streams and mesquite draws where shade and moisture is available. Some shifting of population to favorable areas was indicated.

Literature Cited

- (1) Parish, H. E., and E. C. Cushing. 1938. Locations for blowfly traps: Abundance and activity of blowflies and other flies in Menard County, Tex. Jour. Econ. Ent., 31(6): 750-63
- (2) Parman, D. C. 1945. Effect of weather on *Cochliomyia americana* and a review of methods and economic applications of the study Jour. Econ. Ent., 38(1):66-76.

THE CERCOPIDAE OR SPITTLEBUGS OF MISSOURI

RICHARD C. FROESCHNER

St. Louis, Mo.

This is a continuation of the author's efforts to make better known the insect fauna of Missouri.

In literature there are several Cercopid species recorded for the state which apparently do not belong on our list. *Aphrophora parallela* was originally described by Say (1824) under the generic name *Cercopis*, with the remark, "This species also occurs in Missouri and Arkansa." Goding (1895) repeats these data and places the species in the genus *Aphrophora*. Later Ball (1898) expresses doubt as to the validity of these records and says that they "probably refer to some other species," possibly *inornata* Ball. Van Duzee (1917) apparently does not consider this as probable and includes these records under *A. parallela*. Then Walley (1928) and Miss Doering (1941) quote Ball's conclusions and indicate agreement with them. However, Say's records were made at a time when "Missouri" meant most of the Louisiana Purchase Territory, so too much reliance can not always be placed on them. Therefore, in the absence of specimens and because all other records indicate these to be more northern species, I believe it would be better to drop these names from our list than to hypothesize further.

In 1831 Say described "*Aphrophora bilineata*" and wrote "It inhabits Missouri." Goding (1895) placed this as a synonym of *Philaenus lineatus* Linn. and used Say's locality for that species. Later students have found these two to be distinct, not synonymous, and to have ranges which are more northern and western. So they probably do not occur in Missouri. Here too, then, Say's "Missouri" record is open to the same criticism as stated above under *Aphrophora parallela*. The genus *Philaenus* was said by Miss Doering (1930) to have been collected in Missouri. Except for Goding's above citation, we had no specimen or literature records indicating which species might occur. In reply to a query on this point, Miss Doering informed us that she had no Missouri data other than Goding's 1895 record and had accidentally overlooked his transfer of this locality. Therefore, for the sake of greater accuracy, these names should be stricken from our list.

As a result of this little study our list now contains eleven species in four genera.

Through the kindness of Dr. L. Haseman I was able to review the material in the collection of the University of Missouri.

All records not directly attributable to the author are initialed to show collector, as in the following list: C. W. Wingo, E. H. Froeschner, P. H. Johnson and W. W. Smith.

The illustrations are all the original work of my wife, Elsie Herbold Froeschner.

Keys to the Missouri Subfamilies, Genera and Species of the Family Cercopidae

1. Anterior margin of pronotum straight; eyes rounded
Ceropinae I. **Tomaspis**
Anterior margin of pronotum rounded or angulate medially; eyes
frequently elongate Aphrophorinae 2
2. (1). Clavus with apex acute; hemelytra without a differentiated mem-
brane; form elongate (Figs. 2 and 3) 3
Clavus with apex broadly rounded; hemelytra with a distinct mem-
brane; form globose (Fig. 4) IV. **Clastoptera**
3. (2). Front margin of pronotum angulate medially; vertex and pronotal
disk with a distinct, longitudinal, median carina II. **Aphrophora**
Front margin of pronotum rounded; vertex and pronotal disk without
a longitudinal median carina III. **Lepyronia**

I. **Tomaspis** Amyot & Serville

1. Dark chestnut-brown to black; margin and median line of vertex,
eyes, ocelli and lateral margins of pronotum red; interhumeral line
and two lines transversely trisecting hemelytra red varying to creamy-
yellow; length 8-10 mm. 1. **bicincta** (Say) (Fig. 1)

II. **Aphrophora** Germar

1. Head across eyes wider than prothorax; postclypeus not visible from
above; grayish-brown to brown with hyaline areas on costal margins;
length 7-8 mm. 2. **quadrinotata** (Say) (Fig. 2)

III. **Lepyronia** Amyot & Serville

1. Hemelytra each with spot on base and apex and V-shaped mark on
center fuscous; width across combined hemelytra less than half the
total length of the insect; length 6-8.5 mm.
3. **quadrangularis** (Say) (Fig. 3)

IV. **Clastoptera** Germar

1. Face with upper portion shining black 2
Face with upper portion not wholly black 4
2. (1). Entirely black above; face with lower portion bright yellow;
pronotum with feeble transverse rugae; length 2.5-3.5 mm.
4. **hyperici** Gib.
Not entirely black above 3
3. (2). Clavus longitudinally vittate; face with black of upper portion
not extending down to its middle; length 4.4-5.2 mm. 5. **salicis** Doer.
Clavus not longitudinally vittate; face with black of upper portion
not extending down to its middle; pronotum with transverse rugae
very weak; length 3.5-4.4 mm. 6. **proteus** Fitch

Notes on Missouri Cercopidae

omaspis bicincta (Say). The nominal form only has been found in the Missouri material which has passed through my hands. It probably occurs throughout the state, but it is much more abundant in the southern part where adults are usually found on branches of red-bud, **Cercis canadensis** L. They also come to lights occasionally. Available records indicate imagoes from June 9 to September 3. Barry, Boone, Carter, Howell, Newton and St. Francois counties.

2. **Aphrophora quadrinotata** Say. Adults of this species have been found on various oaks in woods between May 30 and July 23. It seems to be more common in the Ozarks Region of the state. Although all of our specimens agree in such structural characters as having a receding post-clypeus, the head wider than the prothorax, the latter with parallel sides and the males with like genital plates, two of the many at hand differ greatly in color from the usual form. They are strongly suffused with dark brown, more so laterally. This obliterates all the pale costal markings, except the anterior spot which here is yellowish-hyaline and so not very distinct. In the usual form there is frequently a darkening of the ground color, but this does not appear to encroach on the pale lateral markings. Instead it accentuates them by the greater contrast. The two odd specimens were both collected at the same locality, but the second one was taken four years later than the first. This seems to indicate that the form may be established in that particular locality. To my mind, then, this appears to be a distinct color variety which may be known as—

Aphrophora quadrinotata variety **obliterata** new variety. Similar in structural details to nominal form, including the genital plate of the male which has the square emargination in the middle of the posterior margin. It differs only in color, being strongly suffused with dark brown so as to obliterate all of the hyaline areas of the costal region except the premedian one which here is yellow-hyaline and therefore not so distinct. Holotype male: Big Spring State Park, Van Buren, Missouri, June 8, 1944 (R. C. Froeschner). on **Ceanothus**.

Allotype female: same locality as holotype, June 30, 1940 (R. C. Froeschner), on **Pinus echinata**.

It is of particular interest to note that both specimens came from plants other than the usual oaks. At present I have no explanation for this other than these may just be "sitting" records.

Specimens of the regular or nominal form have been collected in Barry, Carter, Iron, Jefferson (EHF), McDonald, Saline, St. Louis, Schuyler and Shannon counties.

3. **Lepyronia quadrangularis** (Say). This very common species was originally described (1825) in the genus **Cercopis** with the remarks, "Inhabits Missouri." Adults have been found the year around, hibernating in grass clumps, under fallen logs and among leaves and other debris on the ground. In early spring they are to be found in great numbers on the wild gooseberries,

Ribes, which plant is one of the first to put out its leaves. Later they fly to many other plants and may be collected from fields or woods. Our records for nymphs show them in their characteristic spittle masses from late May until early July. Miss Doering (1922) lists it for "Atherton, Mo." which is in Jackson County. Barry, Boone, Buchanan, Butler, Cape Girardeau (CWW), Cass (EHF), Clark, Cole, Howell, Jackson, Jasper, Jefferson (EHF), Lafayette, Lawrence (WWS), McDonald, Mississippi, Morgan, Newton, Pemiscot, Perry, Pike, Pulaski (EHF), Ste. Genevieve, St. Louis, Saline, Shannon, Stoddard, Taney, Texas and Vernon counties.

4. **Clastoptera hyperici** Gib. The only available Missouri record is a specimen collected on June 19, 1930 at Columbia (Boone County) (PHJ).

5. **Clastoptera salicis** Doer. Specimens from "Missouri" are listed (1928) among the paratypes of this species. We have a single specimen collected in Mississippi County on August 11.

6. **Clastoptera proteus** Fitch. Both varieties of this species are recorded for "Missouri" by Miss Doering (1928) and should occur throughout the state. A single specimen of the nominal form was taken from the Japanese beetle traps in St. Louis on July 23. The color form **nigricollis** Fitch is apparently more common in the state, twelve specimens being at hand. Of these, five were taken while they had their beaks inserted in the leaves and branches of a mulberry tree, one was found in a Japanese beetle trap and the rest were collected in general sweeping. Extremes of dates are June 16 and July 23. Carter, Jackson and St. Louis counties.

7. **Clastoptera xanthocephala** Germ. This is probably the commonest Cercopid in the state. The two color forms which are separated only on intensity of the dark color are too difficult to separate because of the numerous intergrading individuals. Therefore, I am combining all records under this one heading. It is taken most frequently from sunflower plants, **Helianthus** spp., but is also met with in some numbers in general sweeping in woods and fields. May 4 to October 13 represents the period during which adults have been collected. Barry, Boone, Butler, Crawford, Dent, Dunklin, Howell, Madison, Mississippi, Morgan, New Madrid (EHF), Newton, Osage (EHF), Ozark, Pemiscot, Perry, Pike, Pulaski, Ste. Genevieve (EHF), St. Charles, St. Louis, Scott, Shannon, Stoddard, Taney, Vernon and Wayne counties.

8. **Clastoptera achatina** Germ. The only definite record for the state is that of Miss Doering (1928). General distribution indicates that it should be state-wide in occurrence.

9. **Clastoptera arborina** Ball. A lone specimen was swept from red cedar, **Juniperus virginiana** L., in Jefferson County on August 9.

10. **Clastoptera obtusa** Say. A pair of the nominal form was collected in Mississippi County on August 8. The variety **tristis** VanD. was listed for the state by Ball (1927). The variety **borealis** Ball has been listed for Iowa and Kansas so it, too, may occur in Missouri.

11. **Clastoptera testacea** Fitch. Most of our specimens have been swept from yellow pine, **Pinus echinata** Mill., in the southern part of the state

during June. A copulating pair was found on the 29th of that month. A single specimen was collected from the same host on October 15. Carter, Iron, McDonald (EHF) and Shannon counties.

References

Although all the literature listed here contain mention of Missouri material (some erroneously), Miss Doering's 1930 "Synopsis" has proved most useful in identifying local specimens.

- Ball, E. D. 1898—A Review of the Cercopidae of North America North of Mexico Proc. Ia Acad Sci., 6:204-226
- 1927—The Genus Clastoptera (Cercopidae). Can Ent., 39:103-112
- Doering, K. C. 1922—Biology and Morphology of *Lepyronia quadrangularis* (Say)—Homoptera Cercopidae Univ. Kans. Sci. Bull., 11:515-569.
- 1929—The Genus Clastoptera in America North of Mexico. Univ Kans Sci Bull., 18:5-153
- 1930—Synopsis of the Family Cercopidae (Homoptera) in North America Jour. Kans Ent Soc., 31:53-64, 81-108
- 1941—A Revision of Two Genera of North American Cercopidae (Homoptera) Jour Kans. Ent Soc., 14:102-134
- Goding, F. W. 1895—Synopsis of the Subfamilies and Genera of North America Cercopidae with a Bibliographical and Synonymical Catalogue of the Described Species of North America. Bull. Ill. St. Lab. Nat. Hist., 3:483-501
- Say, T. 1824—[Descriptions of insects in] Keating's Narrative of an Expedition to the Source of St. Peter's River, Lake Winnepeck, Lake of the Woods, under Command of Major Long Appendix, 2:268-378
- 1825—Description of New Hemipterous Insects Collected in the Expedition to the Rocky Mountains, Performed by Order of Mr. Calhoun, Secretary of War, Under Command of Major Long Jour Acad Nat. Sci. Phil., 4:307-345
- 1830-31—Descriptions of New North American Insects Belonging to the First Family of the Section Homoptera of Latreille. Jour Acad Nat. Sci. Phil., 6:235-244, 299-314
- VanDuzee, E. P. 1917—Catalogue of the Hemiptera of America North of Mexico, Excepting the Aphididae, Coccidae and Aleurodidae Univ. Calif. Pub. Ent., 2:1-902
- Walley, G. S. 1928—The Genus *Aphrophora* in America North of Mexico Can Ent., 60:184-192

PRICE OF BACK VOLUMES

Back Volumes \$2.50 per volume

Subscriptions for back volumes or numbers should be sent to Donald A. Wilbur, Department of Entomology, Kansas State College, Manhattan, Kansas.

CONTENTS OF THIS NUMBER

The Genus <i>Stenocranus</i> in America North of Mexico. R. H. BEAMER	1
Additional Host and Distribution Records of the Sweetpotato Leaf Beetle, <i>Typophorus—viridicyaneus</i> (Crotch), (Coleoptera, Chrysomelidae). RALPH L. PARKER	11
Effect of Temperature on Knock-Down and Kill of Mosquitoes and Bedbugs Exposed to DDT ARTHUR W. LINDQUIST, A. H. MADDEN, and H. O. SCHROEDER	13
The <i>Erythroneura</i> of the <i>Vulnerata</i> Group. R. H. BEAMER	15
Two New <i>Paraspius</i> (Diptera: Dolichopodidae). F. C. HARMSTON and G. F. KNOWLTON	23
Population Studies on <i>Cochliomyia Americana</i> in Arizona. CHRISTIAN C. DEONIER	26
The Cercopidae or Spittlebugs of Missouri. RICHARD C. FROESCHNER	30

Journal of the Kansas Entomological Society

Volume 19

April, 1946

Number 2

PUBLICATION COMMITTEE

PAUL B. LAWSON, Editor, Lawrence
R. H. BEAMER, Lawrence R. H. PAINTER, Manhattan
DWIGHT ISELY, Fayetteville, Ark.



JAMES WALKER MCCOLLOCH
1889-1929

Entered as second-class matter June 7, 1939 at the Post Office at
Manhattan, Kansas, under the Act of August 24, 1912.

JOURNAL OF THE KANSAS ENTOMOLOGICAL SOCIETY

A quarterly journal published in January, April, July and October devoted to Entomology in the Western Mississippi Basin and the proceedings of the Kansas Entomological Society.

Manuscripts for publication may be sent to any of the publication committee.

The Kansas Entomological Society does not make exchanges since the Society does not maintain a library.

Subscriptions to the Journal must be paid in advance. The subscription rate is so low that second notices are not ordinarily sent out.

Payment of Canadian or other foreign subscriptions and bills must be made by international Postal Money Order or by a draft on a New York bank and payable in U.S.A. dollars.

Subscribers are urged to give us their full cooperation in these matters.

Subscriptions should be sent to Donald A. Wilbur, Department of Entomology, Kansas State College, Manhattan, Kansas.

Subscriptions in the U.S.A.,	\$2.00 per year	Single Copy
Canadian or foreign subscriptions,	2.25 per year	75 cents

KANSAS ENTOMOLOGICAL SOCIETY

President, H. H. Walkden, Hutchinson, Kansas

Vice-president, Paul B. Lawson, Lawrence, Kansas

Secretary-Treasurer, Donald A. Wilbur, Manhattan, Kansas

Vol. 19, No. 2, April, 1946

This issue mailed June 15, 1946

Kansas Entomological Society

Volume 19

April, 1946

Number 2

THE FIFTEENTH OR 1945 ANNUAL INSECT POPULATION SUMMARY OF KANSAS¹

ROGER C. SMITH, GEO. A. DEAN,² and E. G. KELLY

Kansas Agricultural Experiment Station

The insect population summary for Kansas covers the calendar year 1945 and is the fifteenth in a continuous series which began with the year 1931.³ The information recorded here is based on a summary of 275 questionnaires of the score card type from the sources indicated in Table I together with the observations and comments of the authors, their colleagues and of those returning the score sheets

Table I. Source and Numbers of Questionnaires Summarized for This Report

	No. in July	No. in October
Group 1. Entomologists in the state	10	11
Group 2. County Agriculture Agents	60	55
Group 3. Farmers, mostly college graduates	3	14
Group 4. Vocational Agricultural Teachers	45	50
Group 5. Agronomists and Horticulturists	12	15
Total reports of each group	130	145
Grand total of all questionnaires summarized for this report	275	

Summary of Weather Conditions (Fig. I and Table II) in Kansas by Months During 1945⁴

January had no unusually high or low temperatures, but there was less sunshine than usual. Excessive damp weather for the month, with heavy snows in the western part of the State, was very favorable for the wheat crop.

February weather was comparatively mild with excessive cloudiness. There were frequent falls of moisture and heavy snow over many areas. It was a favorable month for the wheat crop over Kansas, but an unfavorable month for farm work. The average snowfall was 6.8 inches, which was the heaviest for February in six years. Much corn and grain sorghums had not

¹ Contribution No. 548 from the Department of Entomology

² Entomologists of the Agricultural Experiment Station

³ Extension Entomologist, Extension Division

⁴ Recognition and appreciation for assistance given during the preparation of this summary are due to the same sources and largely to the same individuals who supplied information for recent, previous reports. They consist of the persons grouped in Table I.

⁵ For the other summaries in this series, see the *Journal of the Kansas Entomological Society* for the summaries for 1931 (vol 5), 1932 (vol 6), 1933 (vol 7), 1936 (vol 10), 1937 (vol 11), 1939 (vol 13), 1942 (vol 16), 1943 (vol 17), and for 1944 (vol 18) and the *Transactions of the Kansas Academy of Science* for 1934 (vol 38), 1935 (vol 39), 1938 (vol 42), 1940 (vol 44) and for 1941 (vol 45).

⁶ Notes and Table II based on Climatological Data: Kansas Section, Weather Bureau, U. S. Dept. of Commerce by S. D. Flora, Vol 59, 1945. Flora, S. D. Kansas Weather 1945. Kansas Acad. Science, Trans 48(4), 394-408 March, 1946

been removed from fields. Threshed sorghums, stored on the ground in western counties on account of lack of storage and shipping facilities, were damaged seriously. The snow-covered and muddy fields did not permit pasturing.

March was the fifth mildest March in 58 years, with more sunshiny days than usual, and a heavy fall of moisture over the eastern third of the state. Only a small per cent of the intended oats crop was sown, and planting of commercial fields of potatoes in the Kaw Valley was delayed from two to three weeks. Conditions were favorable for wheat, pastures, and alfalfa. Apricots, pears, plums, peaches, and cherries were in full bloom much ahead of the season.

April was abnormally cool, with heavy and frequent rains and excessive cloudiness. The precipitation was the greatest amount ever recorded in April, except in 1944. The soil in the eastern half of the state was soaked almost throughout the month. Freezing weather was frequent in western counties. On the 4th, a hard freeze occurred over the western half and on the 5th there was a freeze over the entire state. Early blooming fruit was seriously injured. Truck crops were not up. Wheat escaped any serious injury. Sowing oats was seriously hampered and much of the intended acreage was not sown.

May was a month of frequent and heavy rainfall over the northeastern quarter of the state, but the south central and southwestern counties were decidedly deficient. Temperatures over the state averaged considerably below normal for most of the month with excessive cloudiness in the northeastern portion, which caused backward conditions of crops and farm work. Serious overflows occurred in both the Big Blue and Little Blue Rivers, with moderate overflows along the Kansas, Republican, Solomon, Smoky Hill and Marais des Cygnes Rivers. Corn planting was late. Early-planted corn came up but made poor growth. Wheat suffered from dry weather in the southwestern counties and from lack of sunshine and warmth in the eastern part of the state. Pasture and alfalfa made fine growth.

June was a month of cool, rainy and cloudy weather, especially in the eastern part of the state. Farm work of all kinds and ripening of wheat were delayed. Damaging hail and wind storms occurred in many areas. It was the third coolest month since the state-wide record was begun in 1887. Temperatures ranged below normal almost the entire month. Spring work was so seriously delayed by water-soaked fields that much of the intended acreage of corn was not planted, and little opportunity occurred to cultivate what was up.

Wheat matured slowly and by the close of the month little had been cut by combines, though harvest by binders had begun in many areas. Heavy rains, wind and hail on June 30th caused extensive lodging of wheat and serious damage in widespread areas. Cutting of alfalfa was also hampered. It was an exceptionally favorable month for pastures.

July, with the exception of July 1927, was the coolest July in 21 years. The maximum temperatures for the first 18 days seldom rose as high as 90°. The last ten days, however, were abnormally hot. Heavy rains fell over

the eastern half of the state except the northeastern counties. The western half of the state had much less rain fall and was dry at the close of the month. Wheat and second alfalfa crop were all cut. Pastures and wild hay were excellent. Grain sorghum made a good start.

August was a month of considerable hot weather and deficient rain fall, which extended to most parts of the state and caused damage to growing crops in many sections. The rains were spotted and especially deficient in the north central and northwestern counties. The two western tiers of counties had excellent rains with amounts totaling from two to five inches. Conditions were favorable in these western counties for the preparation of a good seed bed and wheat seeding was well advanced. Plowing for the next crop of wheat had progressed rapidly in many other parts of the state, but by the close of the month the soil was so hard and dry that the preparation of the fields for wheat was practically suspended. Grain sorghums made very little growth. Pasture in general held up well.

September was hot and dry during the first three weeks of the month followed by prolonged and heavy rains over the eastern third of the state and the south central counties. There was a freeze and light snow in many western counties. The monthly totals of rain fall in the southeastern counties ranged from 10-15 inches and resulted in damaging overflows. In the northeastern and south central counties the totals ranged from 4-10 inches. Many western and north central counties were needing moisture at the close of the month. The soil was too dry and hard for preparation of seed beds or sowing wheat over the eastern two-thirds of the state until the rains began the last week of the month and then it was too wet for working. The soil in the extreme western counties was in good condition. Corn and grain sorghum suffered on account of the hot dry weather the early part of the month. Pastures made little growth until the rains came. Soybeans matured in the southeastern part of the state and broom corn harvest was well advanced in the southwest.

October was a month of several periods of Indian summer weather, nearly normal temperatures and sunshine, and the absence of heavy or prolonged rains. The fall of moisture over the state was decidedly deficient. There was an abundance of soil moisture over the east half due to the heavy rains near the close of the previous month. In parts of the western half, the upper soil was becoming dry by the close of the month. It was a favorable month for sowing wheat, except the extreme southwestern counties where the soil was too wet the early part of the month. The first killing frost of the season in the northwestern and east central counties occurred the 9th and over the middle and western sections of the state on the 22nd. There was no killing frost in the southeastern counties.

November was a mild and sunshiny month, but nearly a record-breaker for dryness. Two places in the state had as much as half an inch of moisture and many western counties failed to get a measurable amount on any day. It was the smallest amount since 1921, and the 5th smallest November average in 58 years. The month was too dry for wheat which made only slight

growth and furnished little or no fall pasture. However, very little blowing or winter killing was reported.

December was nearly a record-breaker over Kansas for heavy snowfall and prolonged cold weather. There also was more cloudiness than usual. The precipitation over the eastern two-thirds was sufficient to relieve the dry conditions which had prevailed through the two previous months.

It was the 6th coldest December on record and the coldest month in Kansas since January 1940. Many eastern and central counties had snowfall from 10 to 15 inches. The condition of wheat was materially improved over most of the eastern two-thirds of the state, but in several western counties the wheat was badly in need of moisture.

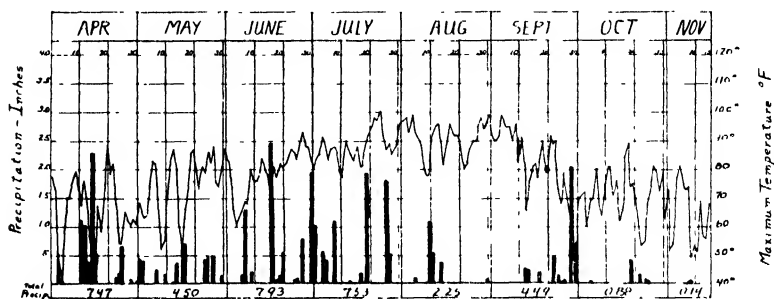


Fig 1 Daily rainfall and temperature chart for the growing season of 1945 at Manhattan, Kansas Chart prepared by D A Wilbur

CROP PRODUCTION SUMMARY FOR 1945

While 1945 production of Kansas crops was 14 per cent less than in 1944, it was a good year for crops in Kansas. The farm value of 1945 crop production was \$499,633,000. The winter wheat production was 207,961,000 bushels, making it more than $\frac{1}{4}$ of the 1945 winter wheat production in the United States of 823,177,000 bushels. The Kansas crop was exceeded only by the 1931 production of 251,885,000 bushels. The 1945 wheat crop alone valued at \$309,862,000 was 84 per cent greater than the 1931 value of all farm crops produced in Kansas. The 1945 crop wintered well, and above normal temperatures in February and March permitted rapid plant growth. Cool April, May and June weather, however, retarded wheat development. Heavy rains, wind, and hail during June, especially the last week of the month, caused extensive lodging of wheat and serious damage in widespread areas.

The planting of corn and grain sorghums was delayed over much of the state because of wet fields, and these crops materially were damaged during August and early September because of dry conditions and hot weather. Early corn and sorghums matured well, but late fields were injured by freezes. The corn crop, estimated at 72,864,000 bushels, was only 60 per cent

*From Kansas 1945 Crop Review, Kansas State Board of Agriculture, Statistics Division, Dec. 20, 1945 Mimeographed Release

Table II.
Summary of Weather Data for the State of Kansas for the period September 1, 1944, to December 31, 1945.

	Temperature in degrees Fahrenheit				Precipitation in inches				
	State Mean	Maximum	Minimum	Mean for 58 years	Departure from normal	State Average	Average for 58 years	Departure from normal	Eastern Third Middle Third Western Third
September, 1944	69.2°	103°	29°	67.7°	-0.5°	1.92	2.81	-0.89	2.95 2.12 0.69
October	58.9°	91°	25°	57.3°	+1.6°	1.73	1.97	-0.24	2.29 1.65 1.25
November	45.7°	85°	5°	43.3°	2.4°	1.96	1.27	0.69	2.71 2.01 1.15
December	30.8°	64°	-5°	33.1°	-2.3°	2.15	.90	+1.25	3.58 2.02 0.86
January, 1945	32.6°	68°	-9°	30.0°	-2.6°	0.88	0.69	+0.19	0.62 0.93 1.10
February	35.2°	79°	2°	33.2°	+2.0°	0.91	0.99	-0.08	1.25 1.06 0.43
March	50.3°	87°	-3°	43.4°	-6.9°	1.96	1.45	+0.51	4.23 1.43 0.23
April	52.0°	92°	6°	54.7°	-2.7°	5.58	2.69	+2.89	7.68 6.03 3.03
May	61.6°	105°	23°	63.9°	-2.3°	3.50	3.81	-0.31	5.39 3.38 1.73
June	68.0°	102°	37°	73.8°	-5.8°	4.72	4.03	+0.69	6.80 4.22 3.14
July	77.2°	108°	47°	79.2°	-2.0°	3.64	3.14	+0.50	4.26 4.25 2.40
August	78.5°	110°	44°	78.0°	+0.5°	2.35	3.18	-0.83	2.55 1.90 2.60
September	69.2°	108°	22°	69.7°	-0.5°	4.89	2.84	+2.05	7.84 5.04 1.79
October	57.4°	93°	14°	57.3°	-0.1°	0.81	1.95	-1.14	0.97 0.87 0.60
November	45.8°	88°	0°	43.3°	+2.5°	0.15	1.25	-1.10	0.33 0.06 0.06
December	27.5°	72°	-24°	33.0°	-5.5°	0.81	0.89	-0.08	1.11 0.88 0.45
Average totals or extremes for 1945	54.6°	110°	-24°	54.06°	-4.2°	30.20	26.91	+3.29	43.03 30.05 17.56

of the previous year's crop. The production of all sorghum for grain in 1945 was 16,632,000 bushels or one-third of the record crop of 49,468,000 bushels. Sorghum for forage was 2,350,000 tons or about 24 per cent less than in 1944. Production of soybeans, 2,740,000 bushels, was second only to the 1944 crop of 3,315,000 bushels. The excessive spring rains delayed planting of oats, barley, and flax and resulted in the lowest yields for these crops in many years. The production of oats was estimated at 17,668,000 bushels compared with the 1944 crop of 27,738,000 bushels or the 10-year (1933-42) average production of 35,931,000 bushels. The barley crop of 6,702,000 bushels was less than one-half the 1944 production of 14,144,000 bushels. Flaxseed production of 695,000 bushels, except for last year, was the smallest since 1938. The all hay production of 2,669,000 tons compares favorably with the 2,767,000 tons produced in 1944. Spring and early summer conditions were favorable for hay crops, but dry August and September weather sharply reduced the yield of late cuttings.

The harvested potato crop of 18,000 acres, was the smallest since 1868. The yield was 1,476,000 bushels. The alfalfa seed production of 220,000 bushels was second only to the 1943 crop of 238,000 bushels. Red clover seed crop of 37,000 bushels exceeds all previous crops and compares with 34,000 bushels in 1944. Sweet clover seed was 119,000 compared with 112,000 bushels in 1944. Lespedeza seed was 19,200,000 lbs., sudan grass 3,500 bushels; broom corn 1,400 tons; popcorn 9,240,000 lbs.; commercial apples 272,000 bushels; peaches 63,000 bushels; pears 117,000 bushels; grapes 4,500 tons. The estimated honey crop was 2,601,000 lbs. or an average yield of 51 lbs. per colony compared with 1,540,000 lbs. or an average yield of 35 lbs. per colony in 1944. The amount of beeswax for 1945 was 52,000 lbs. compared with 32,000 lbs. in 1944.

Descriptive account of the More Important Insect Activities and Climatic Relationships During 1945

Ants of various species continued at a high population level in homes. They were, however, probably no more abundant than in 1944.

The **yellow ant** began emerging in local homes the latter part of January and continued emerging in and around homes until late summer.

The **acrobat ant** (*Cremastogaster lineolata*) was probably the species most

Table III. Population summary of the more common and important insects in Kansas for 1945, as indicated by questionnaire score sheets from nearly all counties.

Key—

- 1 Scarce
- 2 Plentiful, but damage was neither noticed nor reported
- 3 The species was abundant. Some damage was either seen or reported
- 4 Local outbreaks. The species was doing severe damage in certain fields
- 5 The species was in general outbreak. The insects were doing their greatest damage or were as plentiful as they ever get in a locality

Note: This table represents the population scorings by counties for each species of insect listed in the questionnaires, in so far as reported. To use this table, copy the scores for each species in the counties of a state map.

[illegible]

often sent or brought in for identification with *C. laeviuscula* var. *clara* a close second. Winged forms were in flight on March 28.

Several species of aphids were more plentiful than last year and above normal. They include the pea aphid, apple aphids, snowball aphid, chrysanthemum aphids, and melon aphids on cucumbers, squash, watermelons, and cantaloup.

Green bugs were reported in damaging numbers on oats and wheat only in Rush County by the Extension Entomologist but they were present in many south central counties as early as the latter part of April. There were many reports of aphids in wheat but most were based on other species. Green bug damaged spots were notably absent in the state. They were observed in Stafford and Ellis Counties but they could be taken in small numbers nearly everywhere. R. H. Painter stated that they were most abundant on Pawnee with Comanche, Turkey, and Nebred wheats in this approximate order.

The **apple grain aphid** (*Rhopalosiphum prunifoliae*) was plentiful on the roots of wheat in the fall of 1944 in many western counties. Some persons thought they may have contributed to the poor condition of wheat in some fields in the spring of 1945.

Apple aphids on apple buds and blossoms in Doniphan County were exceptionally plentiful in early April and caused a severe withering of blossoms and dropping of setting fruit. There was only about a fifth of a set of fruit as a result of the aphids and cold weather.

Arbor vitae aphids were probably plentiful in many parts of the state because correspondents mentioned that flies and butterflies were common on those bushes.

Pea aphids were abundant in Kansas in 1945, but most damage to alfalfa occurred in western, especially southwestern counties. By mid-April, pea aphid numbers were equal to last year; but the cold, wet (twice normal rainfall) spring favored alfalfa growth in all but southwest Kansas, and it outstripped the aphids. C. M. Slagg reported damage at that time in Barber, Harper, and Sumner Counties. By May 1st, damage had occurred in Barton, Pawnee, and Stafford Counties. Alfalfa was being cut during mid-May though only about 4 inches tall. Pea aphids were reported abundant at Hays by L. C. Aicher, and alfalfa stalks from Coldwater with many convergent lady beetles on them no doubt indicated the presence of pea aphids there. Pea aphid injury was a part of the general injury by cold, wet weather and some fungus disease which caused the plants to be blackish. Young alfalfa stands were particularly adversely affected by the cold, wet weather, especially during April. There was almost no alfalfa bloom in the state on the first crop.

Green ash aphids which cause the leafy galls were common in nursery plantings in Kansas in 1945 up to mid-summer.

The **snowball aphid** (*Anuraphis viburnicola*) was exceptionally plentiful in Riley County from mid-April through June. Apparently they were plentiful in many other parts of the state also.

The **black chrysanthemum aphid** (*Macrosiphoniella sanborni*) was plentiful in April on outdoor plantings and continued so until hot weather in Riley County and perhaps in many other counties.

Woolly apple aphids were plentiful on elms and at the usual places on young apple trees.

The galls of the **grape Phylloxera** were reported abundant on grape leaves at Council Grove the latter part of July.

Apple curculio feeding on dropped apples in the Wathena district was observed by Elbert Eshbaugh. This pest had practically disappeared, but these observations indicate it is increasing in number even in well-sprayed orchards.

Bagworms were plentiful in some nurseries and on evergreens in private plantings in 1945. They were particularly abundant in northeastern Kansas counties during June. They have extended throughout central Kansas and to Wallace, Thomas, Scott, and Stevens counties in western Kansas.

Bees did well after an abnormally early start followed by a set-back due to cold weather and produced a much larger crop of honey than in 1944. Brood rearing was rapid during March because of the warm weather, and the colonies consumed their stores. Then many colonies starved during the cold, wet April and May. The first swarm emerged in the college apiary on April 28th. They had brought in considerable pollen during the good flying weather of March. Some chilled brood was observed after the cold weather of April 2nd and 3rd; but, in general, the bees were three weeks ahead of the calendar. There was poor flying weather during fruit blooming. The fine crop of white and yellow sweet clover and of white clover enabled many colonies in southeastern Kansas to make a good honey crop. There was no late summer and fall honey flow.

Bean leaf beetles (*Cerotoma trifurcata*) were abundant and destructive throughout Kansas in 1945. It was common to observe holes in the foliage of beans during July and August. This species was abundant in Riley County.

Boxelder bugs were scarce in 1945.

Cankerworms were not especially abundant nor destructive in 1945. They were widespread and the scorings show that they were most numerous in southeastern Kansas. The first fall cankerworm moth emerged in Riley County on January 17, and the first moth of the spring species emerged January 26 according to R. L. Parker though January was warmer than usual. A warm period on February 9 and 10 enabled many moths to emerge.

By mid-May the larvae were half to two-thirds grown. Only slight damage occurred in Riley County. This was done to the foliage on the short branches. No spraying was done. Elms were delayed coming into full leaf by the heavy seed crop and the cold April and May weather.

Male moths were reported flying in Topeka on March 28.

Carrot weevils were not as destructive in northeastern Kansas as in previous years. Carrots in many gardens showed no damage by the weevil when dug in the late fall.

Cattle grubs appeared to be declining in numbers on Kansas raised cattle due to the large control campaigns. Native cattle were reported to have few grubs, but cattle shipped into Kansas from the Southwest were fairly heavily infested.

Cattle lice were widely reported in the state, and more attention is being given to their control than ever before. Derris and DDT sprays and powders are being increasingly used. Lice were probably no more abundant than usual. Cattle raisers have just begun to take them seriously.

Chalcids occurred in alfalfa seed in abundance during the latter part of the summer. Alfalfa seed for planting was exceedingly scarce, but Kansas produced its second largest crop of alfalfa seed in 1945, the total production having been 220,000 bushels.

Chinch bugs were less abundant in 1945 than in 1944 and far below the expected numbers. The Bureau of Entomology survey in the fall of 1944 showed an area around McPherson and the northern tier of counties from Republic eastward with a heavy overwintering population, the flint hills section or two or three counties wide from Sumner to Douglas Counties classed as moderate, and the rest of eastern Kansas or west to Jewell and Kingman Counties as light. They were scarce almost everywhere in the spring and few eggs were deposited. The frequent rains and low temperatures during May and June were unfavorable to them. They developed late and were abundant only in scattered areas in eastern Kansas. Few barriers were constructed. Some damage to corn and sorghums was reported from El Dorado and Marysville. Weeds, grasses, and slowly maturing grain furnished food for them, and there was no pronounced migration in most areas, but the adults scattered by flight. The second generation of bugs caused some damage to Sudan grass at the agronomy farm the latter part of August. R. H. Painter observed them in volunteer wheat in McPherson County and adults in corn. Only a small population went into winter quarters.

Clover leaf weevils were normal in numbers and no more numerous than in 1944. The extension entomologist observed them particularly abundant in Ford County about mid-April.

Clothes moths continued at a high peak of abundance in Riley County particularly in April and May and in early fall. The webbing species (*Tineola bisselliella*) appeared to be the most common species.

Codling moths were comparatively abundant and destructive in 1945. An extremely light set of fruit and a large overwintering population of larvae combined with favorable weather for second brood development resulted in the most severe damage to the apple crop in recent years. Many orchards, due to the light set of fruit, were unsprayed.

Colorado potato beetles were again scarce but they were somewhat more plentiful than in 1944. The first generation of larvae developed later than usual, but only where no spraying was done did this species reach damaging numbers in commercial plantings. The first ones in Riley County were observed in May. The early ones seen were on volunteer potatoes.

Cutworms occurred in considerable numbers, probably outbreak numbers in Stevens, Seward, Ford, and Meade Counties. The army, dingy, and clay backed species were sent in from southwestern counties. The extension entomologist observed cutworm damage to alfalfa in this area in March. These insects were normal and caused no unusual losses in central and eastern Kansas. Large number of cutworm moths were reported around doors, screens, trees, bushes, and in garages at Garden City, indicating the usual number of larvae of at least two species must have been present; but no damage was observed or reported.

The **elm calligrapha**¹ was more widely distributed and more injury to elm foliage was done by this new pest in 1945 than before.

Elm seed wing midge larvae dropped from elm trees the latter part of March in Manhattan in large numbers. They were observed on sidewalks, especially in the joints between sections and in spoutings. There was an exceptionally heavy crop of elm seed this spring. This midge causes galls on the wings of elm seed. The freezes of April 2 and 3 probably killed many of the larvae.

European cornborer larvae (*Pyrausta nubilalis*) were found by L. A. Calkins infesting sweetcorn in Wyandotte, Johnson, Douglas, and Shawnee Counties from July 10 to August 25. All were first generation larvae, and the infested sweet corn occurred in gardens in Rosedale and Argentine (Kansas City, Kansas), Lawrence, Topeka, Overland Park, and Olathe. Extensive surveys, particularly of field corn, in other eastern Kansas Counties by Mr. Calkins and R. G. Yapp failed to reveal other infestations. This is the first real invasion of Kansas by this destructive pest.

False wireworms have not been injurious for the past three years. They increased in 1945, and some damage was done in 13 western counties. March wheat had to be re-seeded. The dry fall favored injury.

Flies of most species were more plentiful in 1945 than in 1944.

Hornflies were no more abundant on cattle in 1945 than they generally are in wet seasons. They were about as plentiful as in 1944. The large scale DDT spraying program under the extension entomologist and cooperators focused attention on them. They were present in numbers in early May. They represented the overwintering survivors. They reached peak numbers by mid-June and continued annoying until August when they declined presumably because of the dry weather.

Screwworm flies appeared in two peaks of abundance this year—in early May and October. Early reports were received from the Great Bend region where they were introduced on cattle from Mexico and southern Texas. Autumn cases were especially numerous in eastern Kansas affecting calves and hogs.

Stable flies appeared to be somewhat less abundant than last year or than average. The seasonal history followed that of hornflies.

Fleas on pets and in homes continued at a high peak of abundance but

¹Dean, Geo. A. The elm calligrapha. Kansas Agricultural Experiment Station Circular 234. 7 p. Feb. 1946.

were probably no more common than last year. They were reported from many parts of the state, the peak being August and September. There appeared to be an increase in the numbers of dogs particularly in towns with recent population increases. DDT sprays and powders began to be used, and results were apparently good.

Grape berry moths were abundant and caused severe damage to grapes in northeast Kansas. Many grape berries were wormy at picking time. Some vineyards were not picked because of damage by black rot and the berry worm.

Grasshoppers constituted a problem only in three western counties, but elsewhere there was a small general increase during 1945. The year opened with a threatening overwintering population in over 40 counties west of the line between Jewell and Barber Counties. They were scarce and of little or no consequence east of that line all season. They were observed in destructive numbers in the alfalfa growing areas of northern counties in the western half of the state.

Hessian fly was present at least in small numbers on the wheat harvested; but in spots—counties and fields—the population was high, and noticeable damage was done. There was, however, less damage than for the past 5 years. The wheat crop was so large and the spring growing conditions were so good that this pest had little effect on the over-all wheat situation. Hessian fly damage was observed and reported around Newton and west to Little River in fields at Russell, Hays, Pratt, (Kingman and Reno Counties), and at the Goddard Experimental Fields. The infestation over the entire two-fifths of the state was spotted though favorable to the insect. The harvest survey by the Bureau of Entomology reported a moderate to heavy infestation only in the middle-third section of the state. The stem infestation was determined to be 15.1% in the northern half of this belt and 12.5% of the southern half. The corresponding infestations in the eastern third were 7.3% and 6.4% while in the western third it was 1.8% and 0.9%. Dr. R. H. Painter listed the following counties as having high average stem infestation: Atchison—10.7%, Riley—17%, Neosho—60%, Jewell—26%, Saline 36.3%, Kingman—24.3%, and Sumner 30.2%. This insect was present in Greeley and Wallace Counties, so it occurred entirely over the state.

There was probably no summer brood of hessian fly because of the dry August and September. There was little volunteer wheat this year. The peak of infestation of young wheat occurred at the time of the safe planting date or a little later. The infestation was spotted, and because of the small amount of growth of wheat before cold weather, severe winter injury from this pest was expected.

Horse bot flies were as numerous and annoying as in 1944. They had fewer horses to attack since there has been a marked decline in the population of horses on farms.

Horse flies (Tabanids) were again in outbreak in southeastern Kansas during early August. There was considerable annoyance to cattle, horses, pigs and man. A sharp reduction in milk supply was reported. It was ob-

served that the horse flies alighted on the asphalt between the joints on the highway, and many were caught on car radiators.

A single **Japanese beetle** was taken during the operation of 325 traps in eastern counties June 25 to August 10, 1945. This beetle was taken in a trap along the Santa Fe Railroad yards in the Argentine district of Kansas City, Kansas, near the Missouri-Kansas state line. This single beetle was unquestionably a transient as surveys revealed no larvae or other adults. The traps were operated near the airports at Wathena, Kansas City, Kansas, Olathe, Lawrence, Topeka, and Wichita and the railroad yards of the Argentine district of Kansas City.

Leafhoppers were normal in numbers but less damaging than in the previous year.

Apple leafhoppers were abundant on apple, cultivated and wild grape, red bud, and woodbine foliage in August and September.

The **potato leafhopper** was plentiful during June, and potatoes in the Kaw Valley showed some injury from them. The potato leafhopper was numerous on potatoes, soybeans, and alfalfa in July. Slight curling of foliage was observed due to leafhoppers.

Mosquitoes were exceptionally plentiful during June and were more common than usual during the late fall. Heavy rains in May and June provided ample breeding places. They were reported annoying at Hutchinson.

Widely scattered cases of sleeping sickness in horses were reported from 16 counties none of which were in the Southwest.

The **juniper mealybug** continued to occur in Wichita and Pratt according to H. B. Hungerford. A survey in Wichita revealed 264 infested properties.

Onion plant bugs were present in less than normal numbers, but some damage was observed in eastern and central Kansas in June. The tips of the leaves were dead but the plants were not seriously affected.

Oriental fruit moth appeared to be increasing in eastern Kansas in 1945. The second generation caused some damage to fruit.

Several species of **mites** caused some damage in 1945. Two species of mites did considerable damage to wheat in western, especially southwestern, Kansas, in April and early May. Fields planted in last year's wheat stubble, with little seed bed preparation, as usual were most severely attacked. Leaf rust also contributed to poor condition over much of the state.

Red spider mites were more plentiful up to August 1 than had been anticipated in a cool, wet, cloudy period. Considerable damage was done to evergreens, especially cedars, in many parts of the state in early summer. The mites largely disappeared as usual by mid-August. They were scarce in the fall on apple trees in northeastern Kansas.

The **potato and tomato psyllid** (*Paratrioza cockerelli*) was taken in the college greenhouse June 12. The species was abundant and caused damage to tomatoes. Specimens were identified by Tuttle. This is a first report for the state.

Sheep tick flies were less numerous on native sheep than in 1944, but many lambs from Wyoming, Montana, and other western states were heavily infested when they arrived in Kansas.

Smut beetles (*Phalacrus politus*) were observed by R. H. Painter to be more common than usual on wheat in early June in southwestern Kansas. They were particularly abundant at Meade.

Southern corn root worms killed some popcorn plants in Riley County in June.

Common stalk borers (*Papaipema nebris*) were scarce in corn during 1945. R. G. Yapp found only two larvae during several weeks of scouting for the European cornborer.

Half grown larvae of this species damaged young peach trees in Skinner's nursery at Topeka. They burrowed into one-year-old peach sprouts particularly in rows next to grassy or weedy fields. This is a first report of these larvae burrowing into the twigs of young nursery stock in Kansas.

The **southwestern corn borer** was as numerous and destructive as in 1944 and it spread to several additional counties. Corn planting was delayed from one to three weeks by cold, wet weather. R. H. Painter determined the infestation by the first generation in Butler and Cowley Counties at 5 to 20%. There was a large increase and the second generation reached 50 to 90% infestation in some fields. This insect was found as far east as Riley and Cowley Counties with individual larvae east of this line. The largest center of infestation and damage is in Pawnee, Stafford, Kingman, and counties south of them. It spread to five or more additional counties to the east of the former area. The spread was most marked in the southern counties. There are now approximately 75 counties in which this pest has been taken. There has been a marked decrease in corn acreage in south central Kansas due in large part to this insect.

Squash bugs were less abundant during the early part of the season than usual but they attained normal numbers during August when some insecticidal applications were necessary. A good crop of squash was obtained generally.

The **sweet potato leaf beetle (*Typophorus viridicynneus*)** was reported in sweet potato fields of E. K. Crunk near Oxford, Kansas, the latter part of September.

Strawberry leafrollers caused little damage to strawberry plantings during 1945. Some fields had a large number of larvae going into hibernation. This carry over could cause severe damage in 1946.

Strawberry rootworms were abundant and destructive in northeast Kansas during 1945 according to Elbert Eshbaugh. Most strawberry fields in Doniphan County were damaged by the feeding of the adults and larvae. Some fields were entirely destroyed. A large population of beetles in the

"Hungerford, H. B. The sweetpotato leaf beetle in Kansas. Jour. Kans. Ent. Soc., 18(4):154-155, 1945.
Parker, Ralph H. Additional host and distribution records of the sweetpotato leaf beetle. . . Ibid 19(1):11-12, Jan., 1946.

late summer resulted in many beetles going into hibernation in late September and October. The damage has been most severe since 1941.

Termites were no more abundant nor destructive in 1945 than in 1944. The winged forms appeared in early April in Riley County as a result of the exceptionally warm March.

Mr. H. L. Davids of the Underhill Terminix Company of Wichita reported in September finding a colony of *Kaloterms* in a residence in Wichita. While the dry wood termites have been reported previously in Kansas, this is the first report of a colony which is known to have been established for as much as two years in the state.

White grubs have been gradually increasing for the last three years according to H. R. Bryson, particularly in truck patches, wheat fields and on lawns. The wet May and June caused them to feed near the surface of the ground. They were reported damaging lawns at Mankato and potatoes in Riley the latter part of July. The **green June beetle** was reported frequently during August from southeast Kansas, and injury to ripening peaches was reported from the Kansas City district.

The **wheat straw worm** was scarce in 1945 and caused very little damage.

The **wheat white grub** was less numerous and did less damage to this crop in central counties than is usual in the odd numbered years. This was the grub year in the two-year life cycle.

Cyclocephala immaculata again caused some damage to wheat in the entire western half of the state, especially Rawlins, Sherman, Thomas, Osborne, Scott, Rush, Stevens, and Meade, during the fall of 1944 and the spring of 1945. About the same amount of damage was done to fall sown wheat in 1945. These beetles lay their eggs on decaying stubble in the summer. There is a one-year life cycle.

Wireworms were apparently less numerous than in 1944 or usual. *Aeolus elegans* was reported attacking the germinating seeds of sorghums in Phillips, Riley, and Neosho Counties.

Summary and Conclusions

The year 1945 averaged approximately normal as to temperature, but rainfall was above normal. The year opened with three months of mild weather and above normal precipitation. The spring appeared to be early, but April and May were abnormally cold and wet. Planting of crops was delayed. June was likewise abnormally cool and wet. July opened with cool weather, but hot weather arrived near the end of the month and continued during August and September. Rainfall was markedly deficient during this period except in the western tier of counties, and the drouth in the south central section continued until December. October and November were nearly normal as to temperatures and the fall was considered delightful. It was ideal for insects to deposit eggs for wintering or go into hibernation. December was abnormally cold, the coldest part of the winter, and had exceptional amounts of snow.

It was a good crop year in spite of the cold, wet, late spring and the hot,

dry, late summer and early fall. Insects were not abnormally abundant nor destructive. The weather presumably hindered the increase of grasshoppers and chinch bugs but was largely favorable to hessian fly. DDT began to be used in the control of cattle lice, biting flies on live stock and in gardens.

The following insects and related forms occurred in **outbreak numbers** (scored at 5): Apple aphids (Doniphan County), bagworms, screwworm flies and horseflies (southeastern Kansas).

The following species with those above were **more numerous** in 1945 than in 1944: Apple grain aphids, snowball aphid, green ash aphid, chrysanthemum aphid, grape Phylloxera, apple curculio, alfalfa seed chalcid, Colorado potato beetle, cutworms, elm calligrapha, elm flower midge, false wireworms, grasshoppers, Oriental fruit moth, red spider mites, white grubs, wheat straw worm, tomato worms, rose slugs, bruchids, wireworms.

The following species were **as plentiful** and destructive as in 1944: Ants, pea aphids, woolly apple aphid, bean leaf beetles, blister beetles, canker worms, cattle lice, clothes moths, codling moths, fleas, horn flies, house flies, stable flies, horse bot flies, southwestern corn borer, strawberry rootworms, termites, Cyclocephala sp., hackberry petiole gall, wood borers, cabbage worms, corn ear worm, chiggers, cucumber beetles, mosquitoes, scale insects, squash bug, and tent caterpillars.

The following species and those in the next paragraph were **less plentiful** in 1945 than in 1944: Armyworms, fall armyworm, green bugs, carrot weevils, cattle grubs, chinch bugs, clover leaf weevils, field crickets, hessian fly, leafhoppers, onion plant bugs, sheep tick fly, stored grain pests, strawberry leafroller, wheat white grub, green striped maple worm, red bud leaf roller, and fall webworm.

The following species were **scarce** or absent in 1945: Arbor vitae aphids, box elder bugs, common stalk borer, datanas, garden webworms, and pale western cutworm.

THE GENUS *MINTHOZELIA* IN THE UNITED STATES, (DIPTERA, TACHINIDAE)¹

H. J. REINHARD

College Station, Texas

The genus *Minthozelia* was described by Townsend in 1919 with *montana*, new, as the type and sole original species (Proc. U.S. Nat. Mus., 56:556). The description is based upon a single female specimen and hitherto no additional material appears to have been mentioned in literature. More recently Townsend redescribed the characters of the type specimen without adding materially to the brief and inadequate original characterization (Manual of Myiology, Part 9, 1939, 80). Although no additional specimens of *montana* have come to light, the accumulation of several allied forms may be utilized at least for a liberal interpretation of the generic characters.

¹ Contribution No. 950, Division of Entomology, Texas Agricultural Experiment Station

The new species described below differ from the genotype in having four post-sutural dorsocentral bristles and more or less differentiated recumbent discs on the intermediate abdominal segments, especially in the male. In other respects the characters appear in close agreement and the species are assigned provisionally to *Mirthozelia*, pending the accumulation of additional material in the type species adequate to establish its limits of variability. Nothing is known concerning the habits or host relationships of the genus. It is mainly southwestern in distribution and none of the species apparently has been taken in large numbers in any locality. I am indebted to Dr. R. H. Beamer and C. F. W. Muesebeck for the loan of material and to Chas. T. Greene for notes on the type specimen in the U.S. National Museum. Types of the new species are in the Snow Entomological Collections, U.S. National Museum and in my collection.

Generic characters.—The species here included may be characterized in common as follows: Length 5.5 to 10 mm. Well narrowed and slightly elongate in build with abdomen compressed, especially in male; head slightly wider than high, frontal profile arcuate, strongly sloped and one-half to three-fourths longer than receding facial; antennal axis far below eye middle, about two-thirds head height and longer than vibrissal axis; clypeus nearly flush; epistoma short, not narrowed, gently bowed forward from clypeal plane; vibrissae on oral margin near lower edge of head; facial ridges and parafacials bare; latter equibroad, but narrower than clypeal width; frontal vitta gradually narrowed toward vertex, narrower than parafacial except sometimes on anterior extremity; inner verticals straight to divergent, outer ones smaller but distinct in female; ocellars weak to hair-like, usually two or more pairs curved outwardly; frontal bristles in a single row on outer margin of vitta, directed inward and strongly decussate, stopping at base of antennae, two proclinate and one reclinate orbitals in female; antennae nearly as long as face, third segment about twice length of second; arista shorter than antennae, long plumose to tip, proximal segments short; eyes bare, oblique, not reaching vibrissal level; cheek three-tenths to two-fifths eye height; proboscis short, labella large; palpi slender with tips slightly swollen. Thoracic chaetotaxy. Acrostichal 3,3; dorsocentral 3, 4 (3,3 in *montana*); intraalar 3; supraalar 3; notopleural 2; humeral 2-3; posthumeral 2-3; presutural 1 (outer); postalar 2; intrapostalar well developed; sternopleural 2,1; pteropleural weak, scutellum with 2 lateral, 1 strong decussate apical and 1 smaller discal pair; propleura and prosternum bare; infrascutellum normally developed; sides of postnotum beneath calypters bare. Abdomen longer than thorax, compressed and pointed apically especially in male; first and second segments with a pair of good-sized median marginals, third and fourth each with a marginal row; intermediate segments with one or more pairs of recumbent discs in male but usually weaker or entirely lacking in female; anal segment usually without discs above; sternites covered; female genitalia not adapted for piercing. **Legs** elongate, moderately slender; hind tibiae not ciliate, mid tibiae with one bristle near middle on outer front side; apical segment of fore tarsus moderately widened in female; claws and pulvilli short in both sexes. **Wings**

reaching beyond tip of abdomen, subhyaline; first vein bare, third haired near base; first posterior cell narrowly open shortly before extreme wing tip, bend of fourth vein obtuse, without stump or fold, not far from hind margin of wing; last section of fifth vein about one-fifth length of preceding; hind cross vein bicurved, very oblique, reaching fourth nearer bend than small cross vein; costal spine small to vestigial.

As a detailed characterization of each species would consist mainly of a repetition of the above listed characters, they are omitted for the most part from the following specific descriptions. In the limited material available for study the species are readily distinguished on color characters as indicated in the accompanying key. Only three of the seven species recognized are known in both sexes.

Key to Species of *Minthozelia*

1. Male (unknown in *montana*, *mira* and *ruficauda*) 2.
 Female (unknown in *metallicis*) 5.
2. Parafrontals silvery white pollinose. 3.
 Parafrontals with heavy opaque gray pollen tinged with yellow towards vertex, abdominal segments two and three gray pollinose well beyond middle above, apex of fourth red, Ohio, North Carolina *metallicis*, n. sp.
3. Abdomen distinctly reddish on sides 4.
 Abdomen entirely black, segments two and three silvery on basal two-fifths, fourth with row of discals; third antennal segment largely black, Arizona *nitens*, n. sp.
4. Fourth abdominal segment black, usually without discals; genital forceps narrow tapering gradually from base to tip, Texas, Arizona *argentosa*, n. sp.
 Fourth segment red on apex, bearing discals above; forceps much wider at base, equibroad to apical third thence suddenly narrowed to a short beak, latter with tip compressed and rounded in profile, Arizona *gracilis*, n. sp.
5. Four postsutural dorsocentrals 6.
 Three postsutural dorsocentrals; cheek three-tenths eye height; abdominal segments two to four pollinose on basal third, Arizona *montana* Townsend.
6. Abdomen black to tip 7.
 Abdomen black with anal segment red at least on apex 8.
 Abdomen wholly red, translucent at sides, intermediate segments pollinose on basal fourth to third; cheek nearly two-fifths eye height, Texas *mira*, n. sp.
7. Frontal vitta at base of antennae subequal width of parafrontal; third antennal segment largely black; abdominal segments two and three pollinose on basal third or less *nitens*, n. sp.
 Frontal vitta about one-half as wide as parafrontal; antennae

wholly red; abdominal segments two and three pollinose on basal two-fifths or more *argentosa*, n. sp.

8. Anal segment of abdomen wholly orange red, without any pollen on basal margin above, segments two and three with sharply limited pollen bands restricted to basal fifth at sides and widening to about basal third on median line above, New York . *ruficauda*, n. sp.
 Anal segment blackish and pollinose on basal third, remainder shiny red; intermediate segments silvery on basal third to two-fifths the pollen not sharply limited on hind margin of fasciae except at sides *gracilis*, n. sp.

Minthozelia montana Townsend

Minthozelia montana Townsend, Proc. U. S. Nat. Mus., 56, 1919, 556 Manual of Myiology, Part 9, 1939, 80 (redescription)

Female.—Length 5.5 mm. Front at vertex two-sevenths head width and in profile three-fourths longer than face; ocellar triangle with about five small irregularly placed divergent hairs; parafrontals and parafacials silvery white pollinose; cheek three-tenths eye height; palpi yellow; frontal vitta brownish, narrower than parafrontal; antennae red, third segment slightly infuscated.

Thorax black, with heavy whitish pollen showing four indefinite dark vittae above; three post dorsocentrals; scutellum black, with scattered setulae above and one pair of discals about one-third as long as apical decussate pair; calypters glassy white. Wings clear, rather long and narrow. Legs black, fore tarsi somewhat widened.

Abdomen black to tip, basal third of segments two to four silvery pollinose, remainder of each shiny black tinged with red; intermediate segments equal and slightly longer than one and four, no discals; genitalia not adapted for piercing. Male unknown.

Holotype.—Female, Sixshooter Canyon, Pinal Mountains, Arizona, 5000 ft., September 2, 1917 (C. H. T. Townsend), in the U. S. National Museum.

Minthozelia argentosa, n. sp.

Male.—Length 8-9 mm. Front at vertex one-fifth head width, gradually widening to anterior fourth thence rapidly so into facial angle, frontal profile two-thirds longer than facial; head wholly silvery white pollinose with reddish ground color of cheek grooves apparent in certain angles; parafrontals bare except a few minute hairs along upper outer margin; ocellar triangle bearing about three pairs of divergent hairs, anterior ones approaching size of bristly hairs; frontal vitta velvety black, subequal parafrontal width on anterior extremity; antennae red, slender third segment tinged with black, not quite twice as long as second; palpi red; cheek two-sevenths eye height.

Thorax entirely silvery white pollinose, notum indistinctly vittate; chaetotaxy as mentioned above but the inner presutural bristle moderately developed; scutellum black; calypters large, semi-transparent, white. Wings long, narrow, subhyaline with a slight yellowish tinge extending nearly to hind margin; veins including costa yellow; epaulets blackish. Legs black,

long and moderately slender, rather weakly bristled; fore tarsus nearly one-half longer than tibia.

Abdomen compressed and pointed apically, black with sides broadly reddish, last three segments silvery on basal half or more; two to three pairs of recumbent discals on segments two and three, none on fourth; anal orifice long and narrow, forceps united, slender tip compressed and widened in profile; accessory process extra slender, curved inward, about as long as forceps; fifth sternite retracted.

Female.—Vertex about three-tenths head width, front widening gradually to antennal base; outer verticals one-half as long as inner ones; one reclinate and two proclinate orbitals, all stronger than frontals; third antennal segment somewhat widened on apical half, wholly red; frontal vitta barely one-half parafrontal width on entire length; cheek fully one-third eye height. Abdomen not so strongly compressed or pointed as in male, black with only a trace of red on sides near base, last three segments silvery on anterior half or less, discals on intermediate segments small, depressed but differentiated; genitalia retracted, terminating in a blunt-tipped larvipositor. Legs distinctly shorter and stouter than in male.

Holotype.—Male, El Paso, Texas, August 6, 1919. Allotype: female, Bexar County, Texas, June 8, 1928 (H. B. Parks). Paratypes: 1 male, same data as holotype; 1 male, Chiricahua Mountains, Arizona, July 4, 1940 (D. E. Hardy) in the Snow Entomological Collections, 3 males, "Cave Ck. Can., Ariz. Chiricahua Mts., July 4-8, 40 (D. G. Hall)" in the U.S. National Museum.

Minthozelia mira, n. sp.

Very similar to the preceding species, from which it differs, mainly in color pattern as follows:

Female.—Length 8.5. Abdomen wholly red, with pollen on segments two and three restricted to basal third above and less at sides, anal segment shiny, devoid of pollen except on ventral basal margin, discals on intermediate segments barely differentiated; vertex nearly one-third head width; frontal vitta deep brown, slightly over one-half parafrontal width; cheek almost two-fifths eye height; legs reddish black, tarsi darker.

Holotype.—Female, College Station, Texas, June 19, 1920 (H. J. Reinhard).

This specimen and the allotype female of the preceding species were determined as *M. montana* Townsend by the late Dr. J. M. Aldrich. Aside from their larger build, both species differ from the genotype in having four postsutural dorsocentrals. There appear to be no important structural differences between these forms and additional material may eventually prove *mira* a color phase falling within the specific limits of *argentosa*.

Minthozelia gracilis, n. sp.

Smaller and more slender in build than *argentosa*, from which it is at once distinguished by the red-tipped abdomen.

Male.—Length 7-9 mm. Frontal profile about three-fourths longer than facial; vertex just over one-fifth head width, the front gradually widened

forward; head silvery pollinose on dark ground color except cheek grooves which are reddish; frontal vitta velvety black, as wide as parafrontal on anterior extremity but narrowed to one-half width of same before triangle; latter with several pairs of small divergent hairs, with anterior pair at times moderately differentiated; antennae red, third segment tinged with fuscous, rather slender and about one-half longer than second; palpi red; cheek slightly exceeding one-fourth eye height.

Thorax and scutellum black, silvery white pollinose, notum marked with four indefinite dark vittae. Wings clear, veins yellow, calypters large, translucent, white. Legs black, elongate, weakly bristled.

Abdomen strongly compressed and narrowed apically, black the sides and apex reddish, with silvery pollen on basal half or more of last three segments; discals depressed but distinct, irregular at times, two to three pairs on intermediate segments and one or two on anal; genitalia retracted, forceps as mentioned in key; accessory process very slender from base to tip, nearly as long as forceps; fifth sternite wholly retracted.

Female.—Front at vertex three-tenths of head width, widening slightly towards antennae; outer verticals weak and less than half as long as inner pair; ocellars vestigial; third antennal segment broader and palpi more thickened than in male; cheek about one-third eye height; abdomen broader but not so pointed apically, wholly black with red apex, last three segments silvery on basal third to two-fifths; discals barely differentiated on intermediate segments and none on fourth; legs shorter, stouter, last segment of fore tarsi slightly widened.

Holotype.—Male, Cloudcroft, New Mexico, June 28, 1932 (R. H. Beamer), in the Snow Entomological Collections. Allotype: female, Culberson County, Texas, July 14, 1937 (C. E. Heard). Paratypes: 1 male, same data as allotype; 2 males, Las Cruces, New Mexico, July 3, 1940 (E. E. Kenaga), 3 males, same data as holotype and 1 male, Chiricahua Mountains, Arizona, July 4, 1940 (R. H. Beamer), all in the Snow Entomological Collections.

Minthozelia metalis, n. sp.

Grayer in general aspect and the abdomen more extensively pollinose than in any of the related forms.

Male.—Length 7-9.5 mm. Arcuate frontal profile about two-thirds longer than facial; front at vertex barely one-fifth head width, slightly wider to lower fourth thence diverging evenly in facial angle; head pollen gray with a light yellowish tinge on parafrontals near vertex; ocellar triangle beset with a series of three or four pairs of divergent hairs, anterior pair somewhat larger and slightly proclinate; antennae mostly red, third segment less than twice length of second; palpi red; cheek fully one-third eye height.

Thorax and scutellum black, densely gray pollinose, not distinctly vittate above. Wings hyaline, tinged with yellow on costal margin, veins brown; calypters transparent white, with a uniform tawny tinge. Legs black, long and rather slender, front tibia with one stoutish bristle near middle on outer hind side; front tarsus fully one-half longer than tibia.

Abdomen elongate, conical, black with sides and apex reddish, last three segments gray pollinose on anterior three-fifths or more above; two or three pairs of depressed discs on intermediate segments, sometimes irregularly spaced; genitalia reddish, forceps narrow, tapering evenly from base to tip; fifth sternite entirely concealed. Female unknown.

Holotype.—Male, Amherst, Ohio, July 8, 1922 (A. J. Barckert). Paratype: 1 male, Pineola, North Carolina, June 15, 1934 (J. A. Harris).

Minthozelia nitens, n. sp.

A shiny black and silvery fly with narrow abdominal fasciae in female, antennae blackish.

Female.—Length 8.5 mm. Frontal profile a trifle over one-half longer than facial; front at vertex about one-third head width, diverging gradually to antennal base; head silvery white pollinose; frontal vitta velvety black, at antennae subequal parafrontal width, narrowed towards vertex; ocellars small or hairlike; outer verticals small but distinct; one reclinate and two stout proclinate orbitals; third antennal segment mostly black, rather narrow at base but somewhat widened apically, twice longer than second; palpi red, slender; cheek one-third eye height.

Thorax and scutellum black, wholly silvery pollinose, notum marked with four changeable dark vittae which are defined only at certain favorable angles. Wings clear, veins brown; calypters opaque white. Legs black, moderately stout; apical segment of fore tarsus somewhat widened.

Abdomen moderately long and pointed, wholly black, last three segments silvery on basal third or less; discs at most barely differentiated on segments two and three, none on four; anal orifice narrow, genitalia retracted.

Male.—Length 6.5 mm. (one specimen). Vertex one-fifth head width; legs long and slender; abdomen strongly compressed and silvery fasciae distinctly wider than in female; discs differentiated on each of last three segments; genitalia retracted, forceps united, rather narrow, tapering from base to tip.

Holotype.—Female, Chiricahua Mountains, Arizona, July 4, 1940 (R. H. Beamer), in the Snow Entomological Collections Allotype: male, Red River, New Mexico, 9000 ft., August 7, 1940 (F. Snyder) Paratypes: 1 female, same data as allotype except dated August 14, 1940; 2 females, Cave Ck. Can., Arizona, Chiricahua Mts., July 4-8, 40 (D. G. Hall) and Hot Springs, Arizona, June 26 (H. S. Barber) in the U.S. National Museum.

Minthozelia ruficauda, n. sp.

Female.—Length 9-10 mm. Frontal profile strongly arcuate, one-half longer than facial; front at vertex barely one-third head width, diverging downward in the facial angle; head silvery pollinose; frontal vitta deep brown to blackish, narrower than parafrontal except on anterior extremity; orbital bristles variable, two to four proclinate and one reclinate; outer verticals strong, about two-thirds as long as inner ones; ocellar triangle with row of four pairs of small divergent hairs, the anterior moderately differentiated and sometimes slightly proclinate; antennae red, somewhat darker

below arista, second segment elongate, over half as long as third; palpi red, slender; cheek nearly two-fifths eye height.

Thorax entirely silvery pollinose, with indefinite dark vittae above, scutellum black. Wings clear, veins yellow, third with two to five setulae at base; calypters opaque white. Legs black, femora moderately stout, gray pollinose; apical segment of fore tarsus slightly widened.

Abdomen moderately broad at base, compressed and pointed apically, shining black with orange red anal segment; latter without any pollen above but segments two and three silvery on narrow anterior edge; no discals; anal orifice slitlike, genitalia retracted. Male unknown.

Holotype.—Female, Forest Hills, L.I., New York, July 4, 1927. Paratype: 1 female, same data. Both specimens donated by Dr. Stanley W. Bromley.

Unidentified material: One teneral male specimen from Goldthwaite, Texas, collected by the late C. E. Heard, is apparently distinct from all the species identified above. It is too poorly preserved for description and inclusion here.

A NEW GENUS AND SPECIES OF NOTONECTIDAE

H. B. HUNGERFORD

Lawrence, Kans *

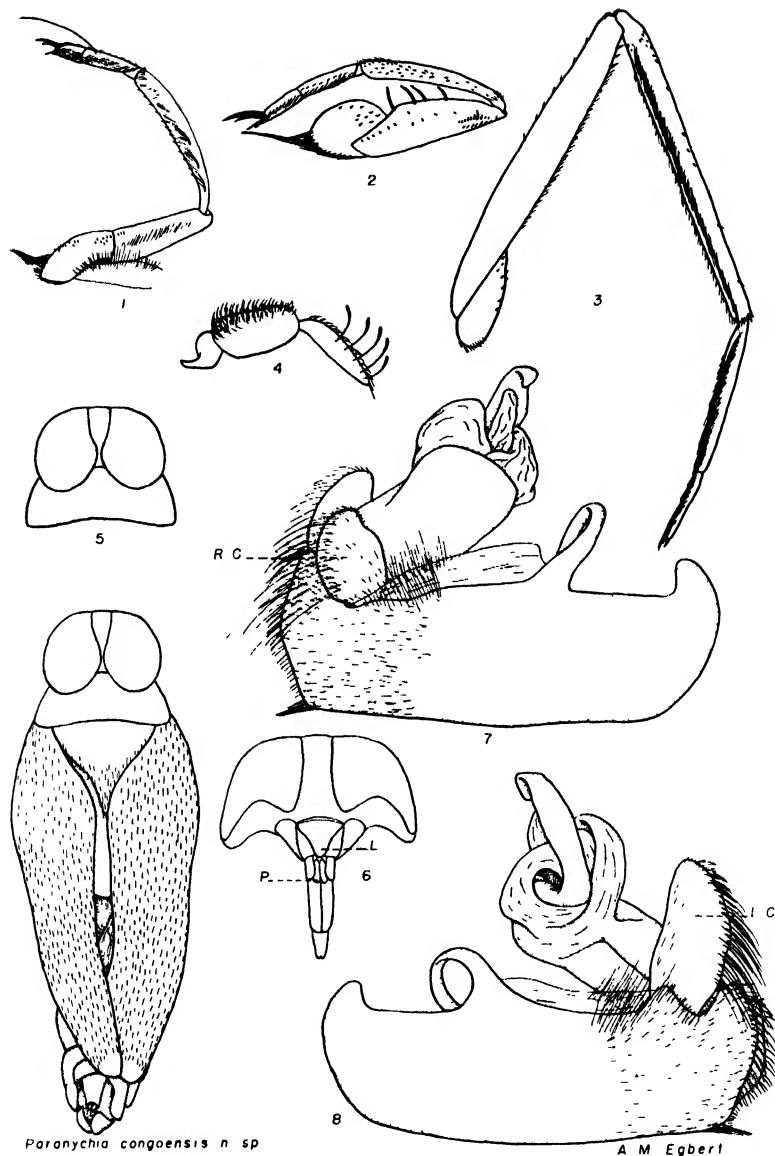
In a collection of Notonectidae from Africa, sent to me for determination by the Carnegie Museum, I find a long series of specimens that appear to be *Anisops tuberculata* Poisson but which lack the definite black lines on the vertex as figured by Poisson. In this lot there are 69 males, 74 females and 15 nymphs besides some 15 broken specimens, all from the French Congo. In addition there are eight adult specimens and four nymphs of a species that cannot be placed in any genus so far described. Moreover it possesses a mixture of characters which prevents its running to a tribe in my key to the genera of Notonectidae on page 9 of "The Genus Notonecta of the World" (University of Kansas Science Bulletin, XXI, No. 1).

Paranychia new genus

General facies a little like *Nychia* but more robust. The eyes nearly contiguous at base. The labrum triangular and flat as in *Nychia* and *Martarega*. Antennae three-segmented. The pronotum short, with lateral margins straight to slightly convex, divergent, and prothorax lacking the lateral fovea characteristic of *Nychia* and *Martarega*. Scutellum rather large. The hemelytra opaque, the hemelytral commissure lacking the pit so characteristic of the *Anisopinae*. The front and middle legs short and fairly stout, their tarsi three-segmented in both sexes, the basal segment minute. The middle femur without an anteapical protuberance. The hind legs long, their tarsi two-segmented. All tarsi end in two claws, those of hind tarsi inconspicuous. The infracoxal plates bare but margined with hair. The genital capsule of the male (ninth abdominal segment) cleft behind. The female gonapophyses short.

Genotype: *Paranychia congoensis*.

*Contribution from the Department of Entomology, University of Kansas



Paranychia congoensis n. sp.

A. M. Egbert

- 1 Foreleg of *Paranychia congoensis*.
- 2 Middle leg of *Paranychia congoensis*.
- 3 Hind leg of *Paranychia congoensis*.
- 4 Antenna of *Paranychia congoensis*.
- 5 Head and prothorax of female
6. Head and beak of male showing: L, the labium; p, the two silvery protuberances on the second segment
- 7 Male genital capsule from right side: R.C., right clasper
8. Male genital capsule from left side: L.C., left clasper.
9. *Paranychia congoensis* male, dorsal view.

The following key will separate the genus *Paranychia* from other genera.

Key to genera of Notonectidae

- A. Hemelytral commissure without definite hair-lined pit at anterior end (Subf. **Notonectinae**)
- B. Intermediate femur with anteapical pointed protuberance and antennae 4-segmented (Tribe **Notonectini**)
 - C. Anterolateral margins of prothorax not foveate **Notonecta**
 - CC. Anterolateral margins of prothorax foveate **Enithares**
- BB. Intermediate femur without anteapical pointed protuberance.
 - Antennae 3- or 4-segmented (Tribe **Nychini**)
 - C. Intermediate tarsus with two well-developed segments and a very small basal one. Sides of prothorax not foveate. Infracoxal plates bare but margined with hair **Paranychia**
 - CC. Intermediate tarsus with one well-developed segment. Sides of prothorax foveate. Infracoxal plates covered with hair.
 - D. Antennae 3-segmented **Nychia**
 - DD. Antennae 4-segmented **Martarega**
- AA. Hemelytral commissure with definite hair-lined pit at anterior end (Subf. **Anisopinae**)
- B. Ventral abdominal keel not extending onto last abdominal segment. Male genital segment cleft behind. Males without stridulatory protuberance on front tibia. Females with short gonapophyses **Paranisops**
- BB. Ventral abdominal keel extending onto last abdominal segment. Male genital capsule closed behind. Males with stridulatory protuberance on front tibia. Females with long subspatulate gonapophyses.
 - C. Male with anterior tarsus 1-segmented **Anisops**
 - CC. Male with anterior tarsus 2-segmented **Buenoa**

***Paranychia congoensis* new species**

Size: Length 5.46 mm. to 6.3 mm.; width of head 1.26 mm. to 1.51 mm.; greatest width across body 1.89 mm. to 2.1 mm.

Color: May be uniformly light brown with reddish brown vertex, or there may also be submarginal dark brown bands on the sides of the pronotum, some darker brown patches on the scutellum, along the costal margin and across the middle of the hemelytra which are opaque and covered with short appressed white hairs. Eyes, legs and venter light brown.

Structural characteristics: The eyes at synthlipsis nearly contiguous for a distance about one fifth the length of the vertex as seen from above; the interspace slightly wider in the female. Vertex with slight depression in front, face transversely depressed above the clypeus. The labrum triangu-

lar, its width at base greater than its length (5:3.6), the sides somewhat concave, its tip extending upon the base of the second segment of the beak. The beak short, its tip not reaching the base of the trochanter of the front legs when flexed; in the male the second segment has a pair of small, silvery protuberances on its anterior distal margin. The antennae three-segmented, first segment globose, second segment thickened, third segment slender with five long spatulate hairs and both second and third segments covered with short curved hairs. Length of antennal segments: 1st : 2nd : 3rd :: 10 : 32 : 37. The caudal width of pronotum three times its median length, the lateral margins divergent and slightly convex. The sides of the prothorax pruinose but not foveate. The scutellum wider than long (64:57). The hemelytra opaque, only the narrowed tip membranous; the hemelytral commissure longer than the scutellum (70:50), sometimes with faint depression where the pit would occur in *Anisops*; the costal margin with slight constriction beyond the middle. Hind wings aborted as in *Nychia* which may account for the reduced hemelytra. The legs as shown on Plate ●. The measurements of the front leg: femur : tibia : first and second tarsal : third tarsal :: 100 : 112.6 : 43.5 : 26.5. Middle leg : femur : tibia : first and second tarsal : third tarsal :: 100 : 88.9 : 47.9 : 28.5. In both middle and front legs the tarsal claws are unequal in length, the longer one as long as the third tarsal segment. Hind leg : femur : tibia : first tarsal : second tarsal :: 100 : 94.6 : 42.1 : 25.5. The male genital capsule as shown on Plate ●. The left clasper larger than the right.

Location of types: Described from 4 ♂♂, 4 ♀♀ bearing the label "Lake Onanga, Fr. Congo, A. C. Good, Holland Collection." Holotype ♂, allotype ♀ and two paratypes in Carnegie Museum; other paratypes in Francis Huntington Snow Collections, University of Kansas.

A NEW SPECIES OF EPITEDIA JORDAN (SIPHONAPTERA)*

E. W. JAMESON, JR.
Lawrence, Kans

The known species of *Epitedia* Jordan fall into two groups. The species of the first group, which contains *wenmanni* (Rothschild), *testor* (Rothschild), *faceta* (Rothschild), and *stanfordi* Traub, have the tail of the receptaculum seminis of the female projecting clearly into the head, and have the immovable process of the male divided into two distinct lobes. The shape of the immovable process of *testor* is unknown, the male being undescribed. The species of the second group, in which belong *scapani* (Wagner) and *stewarti* Hubbard, do not have the tail of the receptaculum seminis projecting into the head, and have the immovable process undivided.

Professor R. H. Beamer and the author collected the specimens of the new species described below from the nests of woodrats, *Neotoma floridana osagenis* Blair.

* Contribution from the Museum of Natural History, University of Kansas

***Epitedia neotomae* n. sp.**

This new species resembles the species in the first group in the nature of the receptaculum seminis of the females, and the species of the second group in the shape of the immovable process of the male clasper. The male of the new species can be separated from the males of *scapani* and *stewarti* by the presence of one prominent bristle close to the apex of the immovable process in contrast to three bristles along the dorsal edge characteristic of *scapani* and *stewarti*; by the shape of the manubrium, it being straight in *neotomae* rather than curved as in *scapani* and *stewarti*; and by the shape of the distal arm of sternite IX, there being a bend in *neotomae* and no bend in *scapani* and *stewarti*. The female of *neotomae* can be distinguished from the females of the first group by the shape of tergum VIII, there being an acuminate lobe at the posterior lower angle in *neotomae*.

Male and Female Head. Frons with a small frontal tubercle which projects just beyond the margin of the head. Preantennal region with two rows of bristles, the first row of four or five moderate bristles, and the second row of four bristles, the second from the top being the same size as those of the first row, the remaining three being longer and heavier. A row of four minute setae between these two rows. Postantennal region with three rows of bristles. The first two rows each with six bristles, and the third row with nine or ten alternating large and small bristles. Dorsal border of the antennal groove with three to five fine hairs. The genal ctenidium of two spines, a shorter, wider one lying outside of a more slender, longer one which extends slightly beyond the genal process. The bristles of the second antennal segment short in the male, and extending halfway to the end of the antenna in the female. Labial palpus of five segments, extending almost to the full length of the forecoxae.

Thorax. Pronotal ctenidium of fourteen teeth, cephalad of which is a row of bristles of which are long and heavy, and four short and slender. Meso- and metanota each with three rows of bristles, the caudal being the heaviest.

Legs. The coxae with several rows of bristles or hairs on their cephalolateral borders. Profemorae with five to seven thin bristles on the mesal borders, mesofemorae with one, and metafemorae with none. Four pairs of heavy dorsolateral bristles on the pro, meso, and metatibiae. Tarsal segments heavily clothed with lighter bristles. Fore- and metatarsi with four pairs of lateral plantar bristles and basal ventral pair. Hind tarsi with four pairs of lateral plantar bristles.

Abdomen. First four terga each with a small spiniform on each side. Antepygial bristles three, the central one longest, the inner half the length of the central one, the outer slightly longer than the middle one. Sterna III to VI in the male with four large and two or three small bristles. Sterna III to VI in the female with five large and four or five small bristles.

Modified Segments, Male. Eighth sternite with the caudal margin sloping upward, the apex rounded, and dorsal edge slightly convex. Sternite VIII

with three large and three or four small bristles. Process of the immovable clasper (P, Fig. 2) undivided with the apex rounded and the caudal margin with a slight convex curvature. Immovable process with one large and thirty to thirty-five small bristles. Distal arm of sternite IX (D.A., Fig. 2) with four heavy teeth at the caudal edge of the terminal end, and with a ventral cephalad row of five or six small teeth and bristles, decreasing in size ventrally. Manubrium long, slender, and straight with a slight constriction in the middle, and with the dorsal edge slightly concave. Penis slightly constricted near the middle, ending in a sharp curved point. Springs with a quarter turn.

Modified Segments. Male. Eighth sternite with the caudal margin sloping twice as long as broad, the tail projecting into the head for about one third the length of the latter. Projecting part of the tail shorter than the head. Tergum eight (T. VIII, Fig. 1) with a pronounced acuminate lobe at its lower, posterior angle. Sternite seven (St. VIII, Fig. 1) with eight to ten heavy bristles, and five to eight smaller bristles. Sternite VII with a sinus above and below a lobe located near the ventral margin. Bursa copulatrix heavily pigmented.

Type locality—Five miles north of Lawrence, Douglas County, Kansas.

Types—The holotype male and allotype female were collected from the nest of woodrats by Professor R. H. Beamer and E. W. Jameson, Jr., on October 10, 1945, five miles north of Lawrence, Douglas County, Kansas. The type specimens are deposited in the Snow Entomological Collections at the University of Kansas, Lawrence, Kansas.

Paratypes. Fifteen males and fifteen females collected from the above woodrat nests constitute the paratype series. One pair will be sent to each of the following institutions: United States National Museum, Washington, D.C.; Zoological Museum, Tring, Hertfordshire, England; Rocky Mountain Laboratory, Hamilton, Montana; United States Public Health Service Plague Investigation Station, San Francisco, California; Dominion Entomological Laboratory, Kamloops, British Columbia; and Cornell University, Ithaca, New York.

Additional Records. One male and two females collected at the type locality by J. F. Case from a spotted skunk, *Spilogale interrupta* (Rafinesque); and two males and two females collected by the author two miles south of Ellsworth, Ellsworth County, Kansas, from a woodrat, *Neotoma floridana osagensis* Blair.

The author is indebted to Mr. George P. Holland for assistance with the determination, and to Professors R. H. Beamer and D. S. Farner for critical assistance with the drawings and manuscript.

Explanation of Plate

Fig 1 Modified segments of female, *Epitedia neotomae* new species

Fig 2 Modified segments of male, *Epitedia neotomae* new species

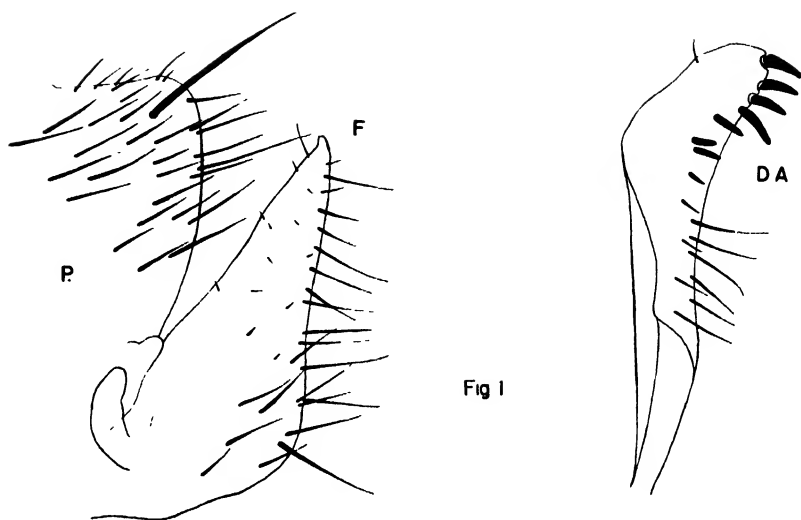


Fig 1

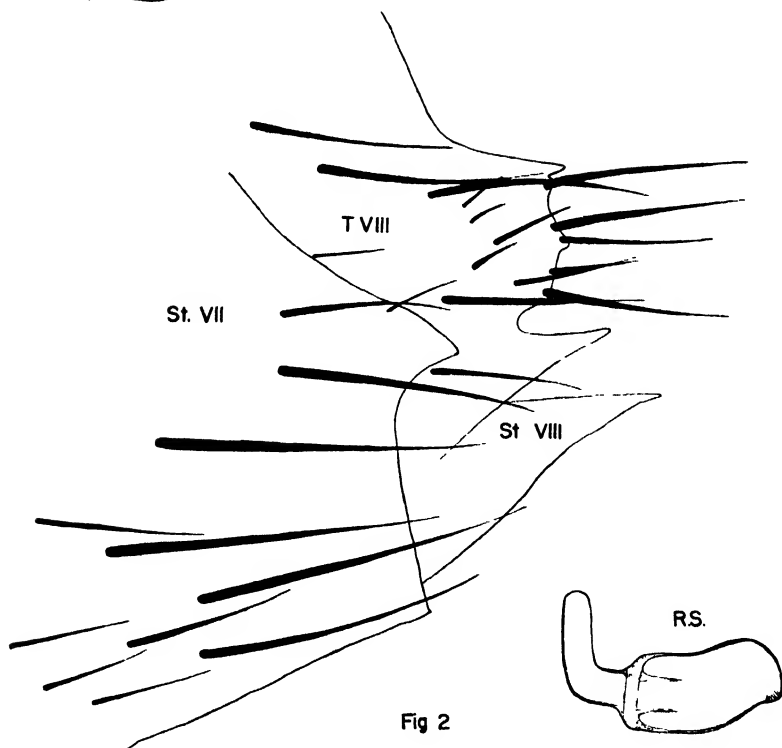


Fig 2

NOTES ON THE JUNIPER MEALY BUG, *PSEUDOCOCCUS JUNIPERI* EHRHORN

LAVERE A. CALKINS*

Yates Center, Kans.

Pseudococcus juniperi Ehrhorn was first named by E. M. Ehrhorn in 1906 from specimens collected on *Juniperus virginiana* at Ashforks, Arizona. In his paper, "A Few New Coccidae, with Notes," Ehrhorn described the species as follows (full description not included): "Adult female oval, about 2 mm. long and 1 mm. broad, convex, slightly covered with secretion. Egg-sac small. Young larvae reddish. Derm colourless, with numerous short, straight spines on the dorsum. Adult female when boiled in KOH turns dark crimson. Antennae 8-jointed. Legs long and slender. Caudal lobes rounding, with one very long, stout bristle and three short, stout spines on the outer and one on the inner margin. Each lobe has numerous round gland orifices. Anal ring large, oval, ———, with six long hairs———."

With the exception of the above description, no mention of the insect could be found by the writer until reports of damage to yard plantings at Pratt, Kansas, were observed in the notes of J. O. Nottingham, assistant entomologist, Entomological Commission of Kansas, for July 9, 1941. Surveys were conducted during the summer of 1941 by Nottingham and Louis Kuitert in Pratt and Great Bend to determine the extent of infestation.

From the records kept by Doctor Reece Sailer, assistant entomologist during the summer of 1942, it is evident that the insect had been doing damage at Greensburg, Haviland, and Medicine Lodge. Complete surveys were made of Haviland, Greensburg, Winfield, and Hillsboro during the summer and fall of 1943 by the writer. On March 18, 1944, the pest was found in Wichita where it apparently had been present for a year or more. During May, 1945, a complete survey was conducted at Pratt. In surveying the surrounding territory the mealy bug was found at Coats.

A letter from Clyde A. Bower, chief inspector, Entomology and Plant Industry Division of the Oklahoma State Department of Agriculture, dated September 5, 1944, and addressed to H. B. Hungerford, State Entomologist for the southern half of Kansas, says in part: "For the past several years the mealy bug has been increasing in number on juniper in yard plantings, principally in northwestern Oklahoma. We have found it quite serious in a number of lawns in Woodward, Oklahoma."

The juniper mealy bug was found during the summer of 1942 approximately 20 miles southeast of Coldwater on native wild cedar by Doctor R. H. Beamer of the University of Kansas. It was again found by the writer on May 16, 1944, on the Shaw ranch southeast of Sun City on cedars growing in a canyon, and again on March 30, 1945, along highway 160 west of Medicine Lodge on native cedar. Cedars found infested on residential properties at Protection, Greensburg, and Medicine Lodge had been taken from the canyon country in southern Barber County, according to property owners.

*Assistant to State Entomologist

The juniper mealy bug usually first attacks the lower and inner branches of the trees, working toward the top and outward, although occasionally one side or perhaps a spot anywhere on the tree may bear the brunt of the infestation. Sapping of the tree leads first to browning of the foliage, followed by dropping of the leaves, with a denuded tree as the end result. A three-year attempt at Pratt to encourage a stripped tree to send forth new foliage was abandoned when the same barren appearance persisted. In most cases multiplication of the pest leads to severe injury or death of small trees within ten days to three weeks after the attack is recognized, unless immediate steps are taken to combat it.

From an economic standpoint, in the opinion of this writer, the greater damage to ornamental plantings is not from the killing of the junipers but rather from partial injury which ruins the trees for landscaping purposes. This would make the mealy bug a great potential danger to the many nurseries raising juniper varieties for sale.

In addition to the native red cedar, *Juniperus virginiana*, the mealy bug has been observed by the writer attacking the following: *Juniperus virginiana* var. *cannarti*, var. *glauca*, var. *burki*, and var. *pyramidiformis*; *Juniperus communis* var. *hibernica* and var. *depressa*; *Juniperus horizontalis*, var. *douglasii* and var. *plumosa*; *Juniperus scopulorum*; *Juniperus sabina*, and var. *von ehron*.

This insect is interesting at this time because, so far as is known, no study has been made of its life history and very little study of its control. Doctor Harold Morrison, Bureau of Entomology and Plant Quarantine, Division of Insect Identification, said in a letter in 1942 to Professor George A. Dean, then state entomologist, Manhattan, that "apparently this insect is of little importance because we have only one previous record of it in our files and we have been unable to find any reference in literature concerning injury caused by it or recommendations for its control."² Apparently the one record mentioned by Morrison was the original description by Ehrhorn in 1906.

Because of work demands which have made it impossible for the writer to remain for sufficient time in localities infested by the mealy bug, little has been done by him toward rearing the insect. Field observations have resulted in finding the insect in egg, nymphal, and adult stages during the winter as well as in the summer months. The low ebb in the occurrence of the pest appears to be in the period following the spring rains of late March, April, and early May. A large percentage of the adult population seems to be adversely affected by the cold weather of late December and January, but eggs and nymphs carry over all winter, with hatching apparently continuing throughout the year. A heavier egg-sac appeared to be present in the infestation at Great Bend during February, 1946, and all adults were found dead. At Wichita, during the survey made also in February, 1946, the egg-sac looked much lighter and live adults were plentiful.

No killing of trees in the wild by this insect has been discovered. This may be due to the fact that the juniper mealy bug may be held in check by predators and parasites. At any rate only branches of those trees have

been killed. With the exceptions of infestations at Winfield and Great Bend, varying degrees of control by natural enemies of the insect were observed in urban infestations. In no case was the control sufficient to halt the spread of the pest or to prevent severe damage to the trees.

During November, 1945, mealy bugs from infested trees at Pratt and Coldwater were examined and very small chalcid wasps were taken from the bodies of adults. These, though immature and in poor condition, were sent to Washington, D.C., where they were tentatively identified by A. B. Gahan of the National Museum. Another series of specimens, reared from material collected on February 4, 1946, and emerging on March 3, 1946, were sent to Mr. Gahan who identified the parasites as follows: *Anagyrus* n. sp., *Tetrastichus minutus* How., and *Pachyneuron altiscuta* How. At least one species of mite and larvae of a Coccinellid beetle have been observed preying upon the mealy bug.

Two species of ants, not yet identified, have been observed feeding on the "honeydew" or exudate of the mealy bug. One ant is very small and black and the other is a larger species, with red thorax and black abdomen. Flies are attracted to the infested trees in large numbers and serve as a means of recognizing possible infestations. What part the ants and flies play in the transmission of the mealy bug from tree to tree is not known although the writer captured several ants carrying nymphs of the insect down an infested tree after the tree had been sprayed.

The first record the writer has of chemical control of the juniper mealy bug was taken from the notebook of Doctor Sailer in which he mentions a nicotine sulphate spray being used at Pratt in 1941. Doctor Sailer experimented with various combinations of materials during the summer of 1942, finally noting that a nicotine sulphate-soap solution gave the best results. The junipers were also banded with some sticky substance which prevented ants from running up and down the trees. He also observed that more than two sprays at short intervals were required to clean out an infestation.

During the past three years the writer has observed that in some cases as many as four and five sprays have been applied at intervals of from four to ten days with re-infestation occurring in a few weeks' time. Also, in one instance, an isolated infestation reappeared after a year of apparent freedom from the pest following a two-summer spray program.

In the summer of 1945 the writer made preliminary experiments with DDT in several combinations at Pratt. A water suspension of DDT with nicotine sulphate appeared most promising. Using a 50% DDT wettable powder at 5% strength by weight, and adding 3 teaspoons of Black Leaf 40 per gallon of material, the kill was apparently a hundred per cent when an examination was made two weeks after the spray was applied to one heavily infested tree. An examination of another tree nearly two months after it had been sprayed with 5% DDT in a colloidal clay suspension with a small amount of a wetting agent added, revealed no live mealy bugs, flies nor ants. At the same time a check tree approximately 20 feet away remained heavily infested, with ants and flies abundant. Materials were

applied with a three-gallon compressed air sprayer. It is hoped that more extensive work with DDT during the summer of 1946, using power sprayers, will bring about satisfactory results with a lower concentration of DDT.

Summary

(1) The juniper mealy bug, *Pseudococcus juniperi* Ehrhorn, apparently is a little-known insect which has become a menace to ornamental juniper plantings in Kansas and in some sections of Oklahoma. (2) It has been found infesting native cedar trees. Some work with DDT has been done and the results appear promising.

Literature Cited

- ¹ Ehrhorn, E. M. "A Few New Coccidae with Notes." Canadian Entomologist, 88, p. 333 (1906)
² Dean, Geo. A. "Control of Three Red Cedar Scales." Kansas State Horticultural Society Report, 47, pp. 80-81 (1944)

A NEW PHYLLOPHAGA FROM TEXAS (COLEOPTERA, SCARABAEDAE)¹

H. J. REINHARD

College Station, Texas

The present new species comes from southwestern Texas and has been awaiting description for several years.

Phyllophaga zavalana, n. sp.

Similar to *P. cribrosa* in general aspect but smaller and more compact in build; the elytra are less distinctly costate and there are genitalic differences.

Male.—Apterous, ovate, gibbous, wholly black, surface above glabrous. Clypeus coarsely, densely punctuate, margin moderately reflexed with apex shallowly emarginate and lateral angles broadly rounded; suture slightly impressed, sinuate. Front flat, punctures close but slightly coarser and deeper than on clypeus. Antenna 10-segmented, shiny nigrorufescent, club ovate, considerably shorter than funicle. Thorax with margin coarsely crenate in front of lateral dilation and more finely so behind, basal angles subrectangular, front angles acute but rounded; disc flattened and declivous at middle on anterior three-fifths or more, densely and coarsely punctate except immediately behind flattened middle area and usually one or more smaller impunctate areas nearer lateral margin, punctures well impressed, surface within each reticulate and bearing a minute recumbent pale hair, mesosternum polished, with a very sparse vestiture of pale yellowish hairs, each of which arises from a well impressed moderately large puncture; scutellum transverse, shiny, smooth or at most with a few scattered fine punctures. Legs shining black; front tibiae tridentate, tarsi with a blunt-tipped tooth at inner apex of segments one to three; hind tarsi subequal length of tibiae; all claws bearing a long acute tooth well before middle;

¹ Contribution No. 951, Division of Entomology, Texas Agricultural Experiment Station

spurs of hind tibiae free, moderately long and slender. Elytra with basal margin slightly reflexed, humeri depressed, sutural and submarginal costae moderately defined and disc with four rather vague oblique costae which become evanescent toward base and apex, intervals with irregularly placed, fine, setiferous punctures. Abdomen moderately impressed at middle, very sparsely and finely punctured, the sides more coarsely so with longer recumbent hairs; fifth segment transversely impressed before hind margin, the following one very short; pygidium wider than long, glabrous, subshiny, disc gently convex with rather coarse shallow sparse punctures, margin narrowly reflexed, ciliate on apical third.

Female.—Similar to male except as follows: Antennal club shorter, slightly over one-half length of funicle; abdomen less flattened at middle, sixth segment coarsely punctate, its median length about one-half the preceding segment; pygidium longer, more narrowed apically, disc nearly flat, impunctate on median line; hind tarsi slightly shorter than tibiae, spurs of latter a trifle shorter but considerably broader in male.

Length, 17-20 mm. Width, 9.5-12 mm.

Holotype male and allotype female, Zavala County, Texas, October 24, 1941 (S. E. Jones) in the Texas Agricultural Experiment Station Collection.

Paratypes: 107 males and 96 females, Zavala and Dimmit Counties, Texas, April to October, 1933-41 (S. E. Jones, M. J. Janes and W. H. Ewart).

In relationship the present species appears intermediate between *cribrosa* and *renodis*; it has the habitus of the former but genitalia about as illustrated for the latter, q.v. (Jour. Kans. Ent. Soc., 12, 1939, 62).

The following key will assist in separating the three species:

1. Scutellum entirely impunctate or with very minute scattered punctures; pronotum flattened at middle of disc and declivous on anterior half or more; male genitalia with inner margin of joined parameres evenly rounded or ring-like in posterior view 2.

Scutellum always coarsely and usually densely punctate; pronotum not conspicuously flattened at middle of disc; elytra distinctly costate; male genitalia with inner margin of joined parameres bearing a small but distinct tooth on each side basad of beak *cribrosa* Leconte.

2. Elytra costate, striae oblique with fine punctures irregularly placed in more or less definite rows; pronotum densely and rather coarsely punctate, usually with an impunctate area at middle and sometimes with smaller ones on lateral margin of disc; sutural striae wide, not well impressed behind middle *zavalana*, n. sp.

Elytra smooth, without obvious striae, puncturation sparse, fine and rather uniformly spaced; pronotum sparsely punctate, surface between punctures smooth on middle half of disc; sutural striae narrow, well defined on entire length *renodis* Reinhard.

GRASSHOPPERS EATEN BY UTAH BIRDS

GEORGE F. KNOWLTON¹
Logan, Utah

Grasshoppers cause injury to Utah crops every year. During a series of years, grasshopper populations have been reduced through natural and artificial control over a number of counties, only to reappear in destructive abundance. Grasshopper baiting operations have been conducted in Utah since about 1936 as a cooperative federal-state-county program. According to county and state estimates such control programs have saved crops valued in excess of \$7,000,000. The value of natural enemies in grasshopper control has appeared to the writer to be important, owing to the numbers and habits of the vertebrate and invertebrate predators, insect parasites and diseases present in Utah.

The following data are presented to indicate the extent to which birds had recently fed on grasshoppers, so far as the data were available from studies conducted since 1932. Eastern sparrow hawks and Swainson hawks commonly are abundant in many parts of Utah and consume enormous numbers of grasshoppers each season, especially in localities where such pests are present in outbreak abundance. Individual western redtail hawks consume large numbers of grasshoppers, but these birds are less abundant in agricultural areas of Utah than the sparrow hawks and Swainson hawks.

During the fall migration when birds travel in large flocks, and in summer in areas where birds are abundant which consume appreciable numbers of insects the size of grasshopper adults and nymphs, birds doubtless are of importance in the down-grading of grasshopper populations. Approximately seventy-five per cent of the birds represented in the table were taken in range areas. Many such collections were made near enough to cultivated districts for the birds to spend part of their feeding time on farms and in cultivated fields.

Table 1. Grasshoppers contained in stomachs of birds collected in Utah, 1932 to 1945, inclusive.

Bird	Grasshoppers in stomachs	Stomachs Containing	Total
Snowy egret	12	1	1
American bittern	1	1	1
White-eyed glossy ibis	13	2	3
Western red-tail hawk	415	8	12
Northern red-shouldered hawk	5	1	1
Swainson hawk	1068	15	23
Eastern sparrow hawk	2897	236	256
Sage hen	63	11	17
California quail	2	2	7

¹ Research professor of zoology and entomology and extension entomologist, Utah State Agricultural College, Logan

² The writer is indebted to J. S. Stanford, C. F. Smith, F. C. Harmston, W. P. Nye, H. F. Thornley, P. E. Telford, T. O. Thatcher, D. R. Maddock, S. L. Wood and other associates and assistants who have cooperated in collecting birds, or saving bird stomachs, included in this summarization.

Bird	Grasshoppers in stomachs	Stomachs Containing	Total
Ring-necked pheasant	46	13	14
Killdeer	11	5	13
Long-billed curlew	18	3	3
Western willet	1	1	1
Avocet	2	2	2
Western mourning dove	3	3	31
Road-runner	3	1	1
Burrowing owl	42	5	6
Long-eared owl	1	1	1
Nuttall poorwill	1	1	2
Night hawk	9	1	6
Red-shafted flicker	1	1	16
Lewis woodpecker	3	3	6
Eastern kingbird	29	14	22
Arkansas kingbird	200	89	112
Say phoebe	34	21	28
Western wood peewee	3	3	3
Great Salt Lake horned lark	118	78	206
Barn swallow	1	1	62
American magpie	37	10	26
American raven	63	8	9
Desert Bewick wren	2	1	1
Rock wren	92	53	97
Western mockingbird	10	3	3
Catbird	5	2	3
Sage thrasher	246	95	113
Audubon hermit thrush	2	2	7
Western robin	14	7	30
Mountain bluebird	149	77	194
American pipit	1	1	102
White-rumped shrike	191	64	71
Western meadowlark	488	133	208
Yellow-headed blackbird	7	5	15
Thick-billed red-winged blackbird	62	27	103
Brewer blackbird	157	61	159
Bullock oriole	11	8	12
Lazuli bunting	3	1	3
English sparrow	7	3	33
Spurred towhee	3	1	2
Nevada Savannah sparrow	1	1	14
Western vesper sparrow	109	56	116
Western lark sparrow	221	113	130
Northern sage sparrow	21	14	40
Shufeldt junco	1	1	43
Western chipping sparrow	46	41	309
Oregon white-crowned sparrow	4	4	17
Gambel sparrow	69	29	133
Total	7024	1344	2855

PRICE OF BACK VOLUMES

Back Volumes \$2.50 per volume

Subscriptions for back volumes or numbers should be sent to Donald A. Wilbur, Department of Entomology, Kansas State College, Manhattan, Kansas.

CONTENTS OF THIS NUMBER

The Fifteenth or 1945 Annual Insect Population Summary of Kansas.	
ROGER C. SMITH, GEO. A. DEAN, and E. G. KELLY	37
The Genus <i>Minthozelia</i> in the United States (Diptera, Tachinidae).	
H. J. REINHARD	52
A New Genus and Species of Notonectidae.	
H. B. HUNGERFORD	59
A New Species of <i>Epitedia</i> Jordan (Siphonaptera).	
E. W. JAMESON, JR.	62
Notes on the Juniper Mealy Bug, <i>Pseudococcus juniperi</i> Ehrhorn.	
LAVERE A. CALKINS	66
A New Phyllophaga from Texas (Coleoptera, Scarabaeidae).	
H. J. REINHARD	69
Grasshoppers Eaten by Utah Birds.	
GEORGE F. KNOWLTON	71

Journal of the Kansas Entomological Society

Volume 19

July, 1946

Number 3

PUBLICATION COMMITTEE

PAUL B. LAWSON, Editor, Lawrence
R. H. BEAMER, Lawrence R. H. PAINTER, Manhattan
DWIGHT ISELY, Fayetteville, Ark.



JAMES WALKER McCOLLOCH
1889-1929

Entered as second-class matter June 7, 1939 at the Post Office at
Manhattan, Kansas, under the Act of August 24, 1912.

ENTOMOLOGICAL SOCIETY JOURNAL OF THE KANSAS

A quarterly journal published in January, April, July and October devoted to Entomology in the Western Mississippi Basin and the proceedings of the Kansas Entomological Society.

Manuscripts for publication may be sent to any of the publication committee.

The Kansas Entomological Society does not make exchanges since the Society does not maintain a library.

Subscriptions to the Journal must be paid in advance. The subscription rate is so low that second notices are not ordinarily sent out.

Payment of Canadian or other foreign subscriptions and bills must be made by international Postal Money Order or by a draft on a New York bank and payable in U.S.A. dollars.

Subscribers are urged to give us their full cooperation in these matters.

Subscriptions should be sent to Donald A. Wilbur, Department of Entomology, Kansas State College, Manhattan, Kansas.

Subscriptions in the U.S.A.,	\$2.00 per year	Single Copy
Canadian or foreign subscriptions,	2.25 per year	75 cents

KANSAS ENTOMOLOGICAL SOCIETY

President, H. H. Walkden, Hutchinson, Kansas

Vice-president, Paul B. Lawson, Lawrence, Kansas

Secretary-Treasurer, Donald A. Wilbur, Manhattan, Kansas

Vol. 19, No. 3, July, 1946

This issue mailed August 12, 1946

**SOME NEW NORTH AMERICAN IDIOCERUS
(HOMOPTERA: CICADELLIDAE)**E. D. BALL¹ and FRANK H. PARKER***Idiocerus rondulus*, n. sp.**

A strikingly white species, the males with a sooty black saddle across the apex of the clavus, the faces of both sexes unicolorous. Length 5.5-7.0 mm. Width 2.5 mm.

Resembling *lachrymalis* Fh., smaller, the head wider than deep, set slightly obliquely on the deep body, wide and clasping the pronotum anteriorly. Clypeus oval, narrower basally than distance between the ocelli. Outer antecapical cell short, triangular, smaller than in *lachrymalis*. Ovipositor exerted about one-third of its length. Male pygofer with long filaments, male antennal discs larger than *lachrymalis*, lanceolate ovate, about twice as long as wide.

Color silvery white, males with a sooty black transverse band crossing the apical portion of the clavus. Face and vertex of both sexes white. Male pronotum usually with four spots in a line across the disc, the median pair larger than the others. Scutellum with basal triangles and a broad median stripe extending to the middle of the disc, pale brown. Elytra white, the cross nervure and a pair of apical triangles on the clavus black. Males with a transverse band across apex of clavus, interrupted along the claval suture, and the narrow scutellar margins, black. In the most heavily marked males a broad stripe on the dorsum extends to the saddle interrupted by large spots on the apices of the claval nervures.

Holotype male, allotype female, and 14 paratypes taken on the narrow-leaved cottonwood, *Populus angustifolia*, at Springerville, Ariz., August 30, 1932, by the senior author.

***Idiocerus couleanus*, n. sp.**

Size and form of *femoratus* Ball, nearly. The male face broader and definitely transversely convex with dark markings on the median line. Length 6 mm. Width 2 mm.

Male face in profile definitely convex instead of flat as in *femoratus*. Intermediate femora normal; the antennal disc long-oval, about half as wide as in *femoratus* but on as long a filament. Ultimate segment of male long

¹ Dr. Ball died on October 5, 1943, after a long illness. The new species here described were included in a revision of the *Idiocerus* complex which Dr. Ball and Mr. Parker had in the course of preparation at the time the former became ill. Much critical work yet remains to be done on the taxonomy of this group, but it seems best at this time to present the following descriptions as a Ball and Parker contribution to our knowledge of the North American forms. Mr. Parker has approved this procedure. Unless otherwise indicated, all types are in the United States National Museum—P. W. Oman, Division of Insect Identification, Bureau of Entomology and Plant Quarantine, United States Department of Agriculture.

and almost truncate posteriorly, the pygofers very heavy, inflated and curved upward.

Color dull, smoky brown, not as dark as in *femoratus*, large spots on vertex, irregular markings on the anterior part of pronotum and widely spaced scutellar triangles black. Nervures dark brown with about five white interruptions on the cubitus and long light areas margining the anteapicals. Male face with a crescent of spots below the ocelli, a broader crescent below this on the clypeus joining with the lateral arcs and a spot on the base of the clypellus.

Holotype male, allotype female, and one male paratype from Wellington, British Columbia, the holotype and male paratype taken April 16, 1897. One male paratype, Boise, Idaho, July 11, 1930, in the collection of Dr. DeLong. One male paratype, Victoria, British Columbia, June 4, 1923, W. Downes.

Idiocerus downesi, n. sp.

Resembling *femoratus* Ball, but darker with the cubitus interrupted with striking round white spots and the median line of face broadly dark in both sexes. Length 6 mm. Width 1.9 mm.

Structure of *femoratus* nearly, but the middle femora not swollen, and the face inclined to be convex. The ultimate segment of male rather long but shorter than in *coulecanus*, n. sp., and the pygofers not curved upward. Male antenna with a rather long filament, disc probably broken off in material at hand.

Color dark brown, darker than in *femoratus* with two large ivory circles on the tips of the claval nervures, and smaller circles along the cubitus. Vertex dark brown with three light triangles at the base, face with a broad black median stripe bounded by light spots under the antennae and the outer margins of the lorae. Below dark, the legs heavily dark lined. Female with the nervures less marked but the face almost as dark.

Holotype male, allotype female, and two male paratypes, Saanish District, British Columbia; six paratypes, Victoria, British Columbia, all sent by W. Downes. Three paratypes, Vancouver Island (Livingstone), and one male, Corvallis, Oreg. The holotype was taken August 18, 1922, the others from June to September.

Idiocerus friscanus, n. sp.

Resembling *femoratus* Ball, slightly smaller with a tawny tinge. Pale tawny brown, the males with a light face with two narrow parallel lines down the middle or with these coalescing into a narrow black stripe. Length 5.5 mm.

Structure of *femoratus* nearly, but the intermediate femora normal. Smaller with a longer and more uniform vertex. Male antennal disc large, elongate obovate, on a long filament. Ultimate segment of male long, the posterior margin scarcely excavated instead of deeply excavated as in *femoratus*; female segment twice wider than long, truncate with the median half slightly produced, pygofers long, slender, parallel margined, the ovipositor exceeding them by twice its width.

Color, mottled brown, the nervures smoky and ivory alternately. Pronotum with a number of irregular spots. A smoky area on the clavus anterior to the large ivory spot on sutural margin. Female face mottled brown with two large black spots on vertex, large dark dashes on upper part of clypeus and short arcs along the margin below, a brown spot on base of clypellus. Male face pale with a slaty median area between the spots and ocelli, bounded by a light band below, clypeus and clypellus with a narrow, slightly wedge-shaped brown or dark median stripe. Legs dark lined.

Holotype male, allotype female, and five paratypes, San Francisco, April 27, 1908, and nine paratypes, San Luis Obispo, June 22, 1931. All taken in California by the senior author. Other examples are at hand from Tia Juana, Mexico, and Oxnard, Santa Barbara, Watsonville, Stanford, and Salinas, Calif (all taken by Ball).

***Idiocerus coconinus*, n. sp.**

Larger, darker than *morosus* Ball with the markings much less distinct. Male antennal discs longer and narrower and ultimate segment of male longer. Length 5 mm.

Form of *morosus*, larger with a longer and more inflated vertex in the male, and a broader head in the female. Male antenna with the disc as large as in *morosus*, but longer and inclined to be pointed at apex.

Color of *morosus* nearly, not as definitely marked. Female face obscurely mottled. Markings outside the spots on vertex faint or wanting. Male vertex with a heavy crescent outside of the spots, often connected along the posterior margin with a median V-like mark. The two stripes on clypeus broad and brown, often coalescing, the lateral stripes on face broader and lighter colored than in *morosus*. Legs pale with heavy dark stripes.

Holotype male, allotype female, and 12 paratypes taken by the senior author on wild gooseberry (*Grossularia pinetorium*) at 9,500 feet on the San Francisco Peaks, Ariz., September 8, 1932. Swarms of nymphs and the first soft adults were found on these bushes August 12, 1929. One female from Long Valley, Ariz., appears to belong here.

***Idiocerus tontonius*, n. sp.**

Resembling *femoratus* Ball, inclined to be broader, paler, and the nervures with setigerous punctures. Male face all light below vertex. Length 5.5. mm.

Form of *couleanus*, n. sp., nearly, broad with an exceedingly broad head. The nervures setigerous, the outer anteapical much shorter than in *couleanus* and somewhat shorter than in *femoratus*, the interruptions on cubitus few and slightly marked. Male antenna with a large obovate or elongate disc on a long filament. Female segment more than half as long as its width, the margin rounding and slightly bilobed on the median third.

Color pale brown, the nervures smoky, lightly interrupted, the pronotum and scutellum heavily dark marked. Female face heavily marked above, omitting a light area around the black spots and two elongate areas between

the ocelli and the eyes, these sometimes extending across face. Clypeus with numerous variable spots sometime aggregated along the submargins. Male face heavily marked above and outside the spots on vertex. Below pale, legs often dark lined.

Holotype male, allotype female, and 11 paratypes, Long Valley, Ariz., August 5, 1929, taken on willow by the senior author.

***Idiocerus apache*, n. sp.**

Resembling *alternatus* Fh. but much more definitely marked and ornamented. Head, three large spots on pronotum, most of scutellum, and elytral saddle ivory. Length 5 mm.

Form of *alternatus* nearly, more robust with a longer vertex. Size of *morosus* Ball nearly, broader. Male ultimate segment extending in the plane of abdomen for one-half its basal width, the lateral margins roundly narrowing, the whole disc rectangularly cut almost to the base, the narrow lateral extensions acutely pointed and slightly curving inward. Male pygofers extremely long, nearly two and one-half times their combined width at apex of plates, rounding and narrowed almost to a point. Male face sloping, the disc of the antenna moderately large, obovate, on a filament about four times the length of disc.

Color, strikingly alternated with cream and ivory, brown and black. Vertex creamy with small spots. Pronotum brown and olive washed with black markings in front and with three ivory spots on disc, the median one elongate. Scutellum rich cream with widely separated basal triangles. Elytra with an ivory saddle and a band of ivory interruptions at the apex of clavus, the nervures pale brown at base, dark at apex, with heavy brown areas on the cross nervure and adjoining veins. Female face with brown mottling above, a transverse light band across above the ocelli and traces of brown stripes below. Male face pale above, the outer pair of stripes broad and black, the median pair narrow and brown and the inner pair on the clypeus faint. Legs pale.

Holotype male, allotype female, and 14 paratypes taken by the senior author on the alligator juniper (*Juniperus pachyphloea*) in the Huachuca Mountains, August 2, 1931. This species has been taken from the juniper in most of the mountain ranges of Arizona from the Huachucas to the Gilas near Yuma and north to Prescott and Williams, again at St. George, Utah (Davis), and Logan, Utah (Eall), and examples are at hand from Tahoe, Calif.

***Idiocerus catalinus*, n. sp.**

Smaller than *rotundens* DeL. and C., the smallest American species in the genus. Vertex pale, usually without spots, elytra pale with a rusty brown band across the middle and similar marking in the claval area basally. Length female 4 mm., male 3.5 mm.

Form of *rotundens* nearly, highly ornamented as in *apache*. Vertex half longer in males than in females. Female ultimate segment long, only one-half wider than its median length. Female pygofers short and broad and the ventral surface flattened, the ovipositor exceeding the pygofers by a

little more than its width. Male antennal disc small, long oval on a filament about three times as long as the disc. Male ultimate segment relatively short but curved around pygofer so that the lateral rounding lobes are vertical, and give the appearance of a quadrate emargination and a strong median tooth. Male pygofer relatively small and narrow and acutely pointed.

Color, pale creamy or ivory with a reddish-brown band across the elytra and similar markings around the disc of the pronotum and scutellum, running back on the elytra as a smoky area in front of the large ivory saddle. Female face with a brown band between the ocelli and the faint spots on vertex. Male face pale above with the spots nearly obsolete, the inner two pairs of stripes narrow, brown, the outer pair broad and black.

Holotype male, allotype female, and 20 paratypes from Santa Catalina Mountains, Ariz., April 26, 1931, taken by the senior author.

***Idiocerus tahotus*, n. sp.**

Broad, short, and banded as in *distinctus* G and B, but the female with two spots on the scutellum and male with distinct stripes on face. Length 4 mm.

Form of *distinctus* nearly, but shorter and more robust. Female ultimate segment long, posterior margin produced and sinuated, the pygofer long and slender and exceeded by ovipositor about two and one-half times its width. Male antennal disk of moderate size, oval, on a short filament. Male ultimate segment with a broad, short median tooth.

Color pale creamy, female without spots on vertex, male with a pair of faint spots on vertex and with vertex and pronotum washed with reddish brown. Elytra creamy, faintly tinged with brown back to the large reddish-brown saddle, a narrow ivory band back of claval areas and apical portions brownish. Male face with all stripes brown, the outer pair broader and darker. Antennal disk black.

Holotype male, allotype female, and 20 paratypes from Bray, Calif., June 30, 1935, P. W. Oman, taken from red currant (*Ribes aureum*). Other material at hand is from Truckee, Calif., Bend, Oreg., and Wenatchee, Wash. (Ball).

***Idiocerus chicanus*, n. sp.**

A banded species much darker, longer, and narrower than *distinctus* with an angular head in the male. Length 5 mm.

Form of *distinctus* G. and B. nearly, the elytra longer and narrowed, giving a wedge-shaped appearance. Female ultimate segment produced and sinuated. Male head slightly produced, ultimate segment short with the lateral folds longer than in *distinctus*, antenna with very small elongate-oval disc on an extremely long filament.

Color gray brown in the female with large spots on vertex and brown or smoky ones on scutellum. Elytra with a broad white band across saddle and a narrower one behind the claval areas, a dark smoky-brown or almost black band between extending to cubitus and ending with the dark cross nervure. Face with pale mottlings. Male with heavy dark crescents outside

of the spots on vertex, very heavy black markings on anterior third of the olive-brown pronotum, scutellum also heavily marked with dark, elytra banded as in the female, the nervures in the dark areas black. Male face pale with six faint brownish stripes, ocelli dark.

Holotype female and a paratype male, Chico, August 11, 1912, another male, Chico, August 28, 1909. Allotype male and five paratypes, Yosemite, June 29, 1931. Two pairs of paratypes from San Luis Obispo, June 22, 1931. All taken by the senior author in California on willow (probably *Salix laevigata*). Three female paratypes, Placer County, Calif. (Koebele). There is also at hand material from Beaumont, Los Angeles, and General Grant Park, Calif.

***Idiocerus renoanus*, n. sp.**

A small inconspicuous gray species as in *alternatus* Fh. but with a definite tawny cast and pale bands. Male but little darker than the female with white legs and rounding vertex. Length 5 mm.

Form of *chicanus*, n. sp., nearly, with a longer female segment and ovipositor. Male vertex rounding as in the female instead of inflated as in *chicanus*. Antenna with large, nearly round disc on a filament that extends just to the margin of the gena under the eye, with the disc beyond.

Color of female pale tawny, the vertex creamy with large spots, slightly more than their width from the eyes, pronotum with an olive cast and about four spots anteriorly, scutellum brown with light markings on disc, elytra subhyaline with two pale bands and tawny nervures outside the bands, face pale, slightly mottled, legs pale. Male slightly darker with heavier spotting on pronotum and dark triangles on scutellum, elytra dark with the dark band behind the saddle quite definitely reddish brown, face and legs all pale.

Holotype male, allotype female, and 14 paratypes taken by the senior author on willows at Reno, Nev., April 30, 1909. Probably overwintering adults as there were no nymphs. Nymphs and fresh adults were also taken below the Portal in Yosemite Valley, June 29, 1941.

***Idiocerus utahnus*, n. sp.**

Form of *verrucosus* Ball nearly, slightly longer and with a slightly less inflated face. Pale tawny with faint spots, the male darker with definite spots and a light face. Length 5 mm.

Face inflated, but not as much as in *verrucosus*. Nervures in the female tawny concolorous, obscure; in the male tawny brown in subhyaline elytra so that they are distinct and show faint interruptions as in *coconinus*, n. sp., except that they are distinct to the apex of the clavus and the base of the first apical.

Color of female tawny above and below, the face paler with the spots small and faint, pronotum tawny with occasional traces of dark dots, scutellum tawny with three white spots in a triangle, elytra tawny subhyaline, the nervures concolorous. Male subolivaceous with a white face moderately

spotted and sometimes with a trace of a dash laterally; two or sometimes four small spots on the pronotum, scutellum with basal triangles and spots on disc, elytra subhyaline with tawny nervures.

Holotype male, allotype female, and 14 paratypes taken in Logan Canyon, Utah, on willow (*Salix bebbiana*), August 13, 1914, by the senior author.

***Idiocerus cephalicus*, n. sp**

Form of *verrucosus* Ball, nearly, but with a more sloping face. Resembling *rotundens* DeL. and C. in size and color but without male antennal disc. Soiled creamy white with spots on vertex and very large triangles on scutellum. Antennal disc simple. Length 4.5-5 mm.

Face less inflated than in *coconinus*, n. sp., forming an almost uniform curve. Elytra transparent, with faint tawny nervures, so that nervures of the under wing obscure the venation. Interruptions on nervures of elytra irregular and few.

Color soiled white, a pair of small black spots on vertex and a pair of large triangles on scutellum, the latter extending up under the pronotum. Elytra subhyaline but the tawny nervures giving them a tawny tinge.

Holotype male, allotype female, and 36 paratypes taken on Palomar Mountain, Calif., July 3, 1935, by P. W. Oman, all swept from incense cedar (*Libocedrus decurrens* Torrey).

This is a strikingly distinct species that might be placed with *rotundens* except for the antennal character.

***Idiocerus bovinus*, n. sp.**

Resembling *ramentosus* (Uhler), with form and white cross nervures of *monoliferae* O. and B., but narrower and more obscurely marked. Pale olive cinereous. Length 5-5.3 mm.

Head narrower than in *monoliferae*, the lower portion of face paralleling the costa. Clypeus arcuately constricted above as in *monoliferae*. Outer antepical cell long and parallel-sided, basal nervures noticeably pustulate; female pygofer inflated, the ovipositor exerted. Male plates and pygofer as in *monoliferae*, the plates broad, flattened, with short filaments. Male antenna simple.

Color olivaceous, with one or two faintly indicated transverse pale bands, one crossing the cross nervure, which is white, and the other at the apex of the clavus. Spots on the vertex small when present, sometimes only faintly indicated in pale male. Face of males pale, the upper face of females pale, with a transverse pale crescent over the ocelli bordered with pale chocolate brown as in the female *monoliferae*. Pronotum often maculate along the anterior margin. Scutellum creamy, the basal triangles and discal pits pale brown.

Holotype male, allotype female, and 3 paratypes from Oxnard, Calif., June 21, 1941; 11 paratypes from Watsonville, Calif., June 24, 1931, taken on black cottonwood (*Populus trichocarpa*) by the senior author.

Idiocerus nogalinus, n. sp.

Smaller and paler than *monoliferae* O. and B., with transverse bands on male elytra. Creamy white face and vertex unmarked. Length 4.7 mm. Width 1.5 mm.

Smaller than *monoliferae* or *bovinus*, n. sp., with the head narrower and not as deep. Resembling in form *cingulatus* Ball, including the thick finger-like male pygofers. Males without antennal discs.

Color of female creamy, the face and vertex unmarked, except for the ocelli, pronotum and elytra with slight purplish cast, scutellum creamy with pale brown basal triangles. Male with face and scutellum as in the female, the pronotum with traces of rufous markings, elytra with broad basal and narrow median brown bands separated by a broad white band across the cross nervure and a narrower less definite white band across the apex of clavus, the apices smoky.

Holotype male and allotype female from Nogales, Ariz., October 19, 1931; 12 paratypes from Patagonia, July 28, 1933; and Naco, Ariz., October 9, 1932, all collected on the valley cottonwood (*Populus wislizeni*) by the senior author.

This species is much smaller and paler than *bovinus*, n. sp., and may be separated from *cingulatus* in that it is narrower, with small metasternal black spots in place of the large ones of that species, and no spots on the vertex.

Idiocerus huachucae, n. sp.

Larger and darker than *amoenus* Van D., with spots on the vertex, a longer clypeus and smaller antennal discs. Tawny above and below with the pronotum and scutellum dark in the males. Length 5.5 mm.

Head in profile more acutely angled with the dorsal line than in *amoenus* thus making the vertex shorter as seen from above. Clypeus of the male not as definitely elevated from the level of the face as in *amoenus* and its margins lacking the ribbed-like appearance. Female segment longer than in *amoenus*, the pygofers shorter. Male antenna with a small, long-oval disc at the end of a moderate filament.

Color tawny above and below, the legs cinnamon. Female with faint brown spots on vertex, male with small dark spots. Male face with inner pair of stripes broad and faint, outer pair broad and dark. Male pronotum heavily dark marked and usually frosted with light on the disc. Scutellum with large black triangles and usually other dark markings, omitting the margins at apex and base. Elytra tawny subhyaline, smoky toward the apex, with a white saddle and sometimes a white line on the commissural line before apex of clavus.

Holotype male, allotype female, and 14 paratypes taken by the senior author on the alligator juniper (*Juniperus pachyphoea*), August 2, 1931, in the Huachuca Mountains, Ariz. This is the most abundant species on this juniper from Prescott and Williams south throughout the southeast section of the state.

***Idiocerus pacificus*, n. sp.**

Resembling *ensiger* Ball in structure but not as definitely marked; resembling *musteus* Ball in color and markings but the female tawny with a long ovipositor and the male with long lateral lobes on the ultimate segment and obovate antennal discs. Length 5 mm.

Form of *ensiger* nearly, the face deeper and more inflated, the ovipositor long but not quite as long as in *ensiger*. Male ultimate segment with lateral lobes elongated, not short as in *musteus* which it resembles in color. Male antennal disc moderately large, obovate.

Color of female tawny, the face mottled and with white circles around the black spots on vertex and a median white "V," three light areas on pronotum, the median one elongate, scutellum pale creamy with tawny or dark triangles, elytra cinereous with a tawny cast and the nervures becoming smoky toward the tips, and with a definite white line along claval suture. Male dull cinereous with dark triangles on scutellum, dark spots on pronotum, and a white face.

Holotype male, allotype female, and five paratypes from Siskiyou Mountains, Calif., June 24, 1934. Six paratypes from Chico, Calif., August 11, 1912, two from Dunsmuir, Calif., August 13, 1912, and one from Salinas, June 27, 1909, all taken from willows in the mountains of California by the senior author.

This species was mixed with *verrucosus* and *musteus* in collections but can be readily separated by the long ovipositor in the female and the obovate antennal discs in the male.

***Idiocerus obispanus*, n. sp.**

Smaller than *ensiger* Ball, with the median lobe of the male segment as long as the lateral lobes. Rufous, the male face with a broad median black stripe. Length 5 mm.

Face in profile retreating but rounded and somewhat inflated above in both sexes, though not nearly so inflated as that of *verrucosus* Ball which it somewhat resembles. Differing from *verrucosus* by the presence of male antennal discs. Female ultimate segment short, sinuately rounded, pygofer moderately long and exceeded by the stout ovipositor about one and one-half times its own width. Male ultimate segment short, the lateral lobes no longer than the median lobe, plates triangularly widened at the base, pygofer small, broadly rounded behind. Male antennal disc long and narrow, on a long filament.

Color uniform pale cinnamon above and below except for the spots on vertex, about four irregular ones on pronotum, the large black triangles on male scutellum and a broad black stripe down the male face. The female may be almost entirely tawny with a cinnamon ovipositor set off by white margins to the pygofer. The darker examples have white circles around the spots on vertex. Male pygofer is creamy on the basal half and cinnamon beyond with a pair of black spots on the outer margins at the base.

Holotype male, allotype female, and nine paratypes taken on a willow with a long, shining green leaf, bluish below, on the pass above San Luis

Qbispo, June 22, 1931. Three paratypes from Santa Margareta, June 9, 1925, and two male paratypes from Muir Woods, June 17, 1934. All specimens taken in the higher mountains of California by the senior author.

***Idiocerus cauterus*, n. sp.**

Form and color of *snowi* G. and B., but larger and with a dark band between the eyes in the male. Length 5-6 mm.

Head wide as in *ramentosus* (Uhler), in profile the head deep and the clypeus paralleling the costa. Venation normal, outer anteapical cell long triangular, nervures not pusulate. Male antenna simple. Male pygofers broad, the plates long, filamentous. Female pygofers inflated, the ovipositor exerted one-third of its length.

Color pale green as in *snowi*, with definite black spots on the vertex. Male with another pair of spots just outside the ocelli and below the spots on the vertex, a dark brown or black band between the eyes omitting large light circles around the spots on the vertex, and a pair of small white spots above the black spots on face that are connected internally with a circle around the ocelli, scutellum with a pair of dark basal triangles. Tips of male pygofers black above. Male clytra smoky towards apex.

Holotype male, allotype female, and 24 paratypes from San Luis Obispo, Calif., June 22, 1931, all taken by the senior author on willows. This species has also been taken at Weed, Big Bear, San Jose, Watsonville, Oxnard, and Pine Valley, Calif.

Readily recognized by the definite black band on the face and the black spot on the pygofers of the male.

**A NEW SPECIES OF DELPHACINE FULGORID
WITH NOTES ON FOUR OTHER SPECIES***
(Homoptera-Fulgoridae-Delphacinae)

R. H. BEAMER
Lawrence, Kansas

1. *Bakerella muscotana* n. sp.

Brachypterous Form

Resembling *Bakerella bidens* Beamer but appearing larger, generally darker in color, round bumps on wings black and aedeagus without lateral retrorse spines. Length: male, 2-2.2 mm.; female, 2.5-2.8 mm.

Structure: Front widest at middle, of about equal width at base and apex, strongly carinate; crown slightly longer than wide in both sexes; anterior fovea usually almost three times as long as basal width. Elytra slightly longer than broad, apices broadly rounded, veins raised, with a few raised black bumps, some of which bear setae. Dorsum of abdomen with semblance of raised bumps on sides of segments beyond second.

Color: Generally very dark with cinereous basal half of elytra quite contrasting. Front dark, more or less lighted spotted. Elytra usually cinereous

* Contribution from Department of Entomology, University of Kansas

with about basal half quite dark except narrow uneven apical border light. **Genitalia in Lateral View:** Male style widest at base, about half as long as aedeagus, almost straight and slightly narrowing to rounded tip. Aedeagus widest at base, slightly narrowed on outer third and bent ventrad at tip with about seven short teeth on dorsal margin near outer third; anal ring without processes.

Holotype ♂, allotype ♀, 40 ♂ and 28 ♀ paratypes, Muscotah, Kansas, June 28, 1946, R. H. Beamer; other paratypes, 46 ♂♂ and 28 ♀♀, same place and collector, May 30, 1946.

Macropterous Form

Like the brachypterous form except the elytra about one third longer than abdomen, with a narrow zigzag black band arising on basal third of costa, paralleling base of wing to cover apex of clavus, also covering two thirds of cross veins from costal margin and ending near middle of apex, these latter two stripes more or less forming a U-shaped mark.

Holomorphotype ♀, Muscotah, Kansas, May 30, 1946, R. H. Beamer. All types in the Snow Entomological Collections.

2 *Liburnia crocea* (Van Duzee)

Kelisia crocea n. sp. Van Duzee, E. P., Bull. Buff. Soc. Nat. Sci., p. 233, 1897.
Liburnia crocea Beamer, R. H., Jour. Kans. Ent. Soc., Vol. 18, July, 1945, p. 100

One of the co-types of *crocea* is before me. It is a male collected at Ames, Iowa, by Professor Herbert Osborn. A label on the pin in Van Duzee's handwriting says "*Stenocranus croceus* Van Duzee." This led me to think that there was some doubt in Van Duzee's mind as to the proper genus for this species for he later published it in the genus *Kelisia* and did not change the original label. Osborn and Ball, in 1897, listed it in *Stenocranus* but changed their minds in later years and placed it back in *Kelisia*. Crawford, in 1914, in his monograph on the Delphacidae, Proc. U.S.N.M., p. 591, put it back in *Stenocranus*. Van Duzee, in 1916, in his Check List of Hemiptera, returned it to *Kelisia* where it remained until 1922 when Dozier, in his "Synopsis of the Genus *Stenocranus*," placed it in *Stenocranus*. The following year Metcalf, in the Jour. of Elisha Mitchell Soc., p. 169, 1923, returned it to *Kelisia* and there it remained until the writer placed it in *Liburnia* (See above reference.)

The shape of the front of *crocea* resembles *Prokelisia* Osb. but the general facies of the internal male genitalia are similar to those parts in *Liburnia paluda* (Kirk). Muir and Giffard. Studies in North American Delphacidae, Bull. 15, Jan. 16, 1924, p. 13, placed *K. paluda* Kirkaldy in *Sogata* Dist. Metcalf, Z. P., Catalogue Fulgoroidea, Araeopidae, 1943, p. 366, placed *Sogata* Dist. as a synonym in the genus *Liburnia* Stal. This species does not have clearly defined generic characters but until such time as further information indicates otherwise, I prefer to leave it in *Liburnia*.

Van Duzee's description of *crocea* is very good except the many specimens of this species I have seen, including the co-type, do not show any or only very slight indications of the fumose markings he describes on the elytra. Most specimens are devoid of coloring in the elytra.

Genitalia: Style of male in caudal view broadest at base, narrowed on outer margin to avicephaliform apex with beak pointed in. In lateral view aedeagus with sides almost parallel, curved dorsally in almost a half circle with numerous small teeth on sides of shaft near middle, a few larger teeth on dorsal margin near apex. Anal ring in lateral view with a pair of ventral processes projecting in two directions, the longer projecting ventrocephalad and the other, much shorter, projecting dorso-caudad. This is an outstanding character of this species and easily separates it from any other I have seen.

Very common in meadow habitats in the central United States.

Lectotype in collection of Iowa State College, Ames, Iowa.

3. *Delphacodes fulvidorsum* (Metcalf)

Liburnia fulvidorsum Metcalf, Z P, Jour Elisha Mitchell Sci Soc, 1923, p 210.

Delphacodes fulvidorsum (Metcalf), Z P, Gen Cat Hemip IV, 1943, p 448

Brachypterous Form

This species was described from three brachypterous males collected at Brownsville, Texas, Dec. 10, 1910. It is a striking species with its black elytra and lighter pronotum and head. During Christmas week of 1945 sixty additional males were taken in the Brownsville area along with ten short-winged females.

Genitalia in Lateral View: Anal segment with a pair of closely appressed processes arising near base and slightly turned out on outer third. Aedeagus tubular, almost straight, with slight fold or overhang dorsally at tip; style broader than aedeagus, bent dorsally near base and slightly caudad at apex.

Female: About same size as male but stramineous in color except abdomen in some specimens quite dark. Elytra with apices rounded, extending to about penultimate segment of abdomen. Hind wings practically absent.

Allotype ♀ and 9 parallotypes, Brownsville, Texas, Dec. 27-29, 1945, R. H. Beamer.

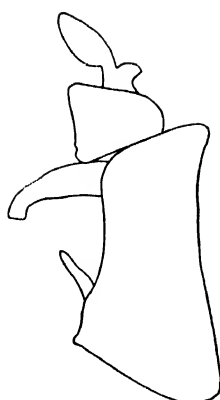
Macropterous Form

Like the short-winged form except color stramineous throughout and elytra widest beyond apex of clavus and extending one third their length beyond the abdomen.

Holomorphotype ♂ and allomorphotype ♀, La Belle, Fla., July 16, 1939,

EXPLANATION OF PLATE

- 1 Lateral view of genital segment of *Bakerella muscotana* n sp
- 1a Greatly enlarged lateral view of aedeagus of *Bakerella muscotana* n sp
- 2 Lateral view of genital segment of *Liburnia crocea* (Van Duzee)
- 2a Greatly enlarged lateral view of aedeagus of *Liburnia crocea* (Van Duzee)
- 2b Caudal-ventral view of styles and aedeagus of *Liburnia crocea* (Van Duzee).
- 3 Lateral view of genital segment of *Delphacodes fulvidorsum* (Metcalf)
- 3a Greatly enlarged lateral view of aedeagus of *Delphacodes fulvidorsum* (Metcalf).
- 3b Caudal-ventral view of style of *Delphacodes fulvidorsum* (Metcalf)
- 4 Lateral view of genital segment of *Delphacodes parvula* (Ball)
- 4a. Greatly enlarged lateral view of *Delphacodes parvula* (Ball)
- 4b Caudal-ventral view of style of *Delphacodes parvula* (Ball)
- 5 Lateral view of genital segment of *Chloriona slossoni* (Ball).
- 5a Greatly enlarged lateral view of aedeagus of *Chloriona slossoni* (Ball).
- 5b Caudal-lateral view of style of *Chloriona slossoni* (Ball)



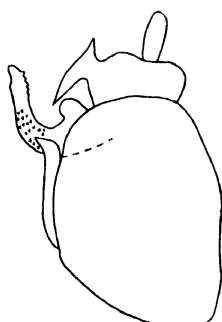
Bakerella muscotana



1a



2b



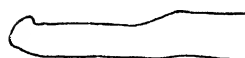
2 *Liburnia crocea*



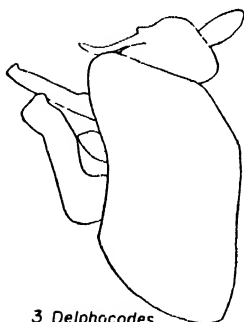
2a



3b



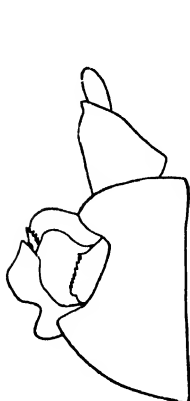
3a



3 *Delphacodes fulvidorsum*



5b



4 *Delphacodes parvula*



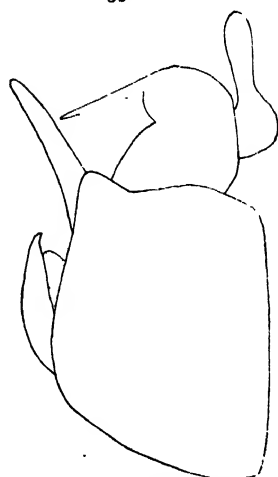
4b



4a



5a



5 *Cnorriona slossoni*

R. H. Beamer; paramorphotypes as follows. 1 ♂, San Antonio, Tex., June 25, 1938, R. I. Sailer; 1 ♀, Homestead, Fla., July 25, 1939, R. H. Beamer; 1 ♀, Okefenokee Swamp, Ga., July 25, 1939, R. H. Beamer.

Brachypterous ♂ holotype and 1 paratype in collection of Ill. Nat. Hist. Survey. Types of this paper in Snow Entomological Collections.

4. *Delphacodes parvula* (Ball)

Kelisia parvula Ball, E. D., Can. Ent., 34, p. 264, 1902

Delphacodes parvula (Ball), Beamer, R. H., Jour. Kan. Ent. Soc., Vol. 18, July 1945, p. 100.

The following is the original description: "Size of *pallidula* nearly, but with broader elytra, a shorter species than *salina*, with an unmarked front; front and above entirely pale. Length 3.25 mm

"Vertex weakly carinate, broad, but little longer than wide, rounding to front; front as in *salina*; elytra longer than abdomen, broad at apex; venation distinct, nervures strong and slightly setigerous, the third apical veinlet but once forked near the apex.

"Colour: pale straw or whitish; vertex and scutellum tinged with orange, the abdomen in male smoky brown and black.

"Described from one female from Coolidge, Kansas, and a pair from Ames, Iowa, all collected by the author."

This is one of the commoner species of *Delphacodes* found in the central United States. It may be collected from a small wiry sedge growing in moist spots of wild prairie upland meadows. Numerous specimens of both macropterous and brachypterous forms are before me.

In general the color is cinereous varying from quite light to very dark. The orange of the front and vertex spoken of in the original description is not very evident in the several hundred specimens examined. The abdomen can be described as either dark with light or orange longitudinal stripes or black with orange or light longitudinal stripes.

Genitalia in Lateral View: Anal segment without hooks or spines; style rather boot-shaped with enlarged toe and prominent heel; aedeagus tubular, bent ventrally at right angles on outer third with a crown of spines near outer fourth; aedeagal brace broad with sharp marginal serrations.

The original description was written from three long-winged specimens. The male from Ames, Iowa, is here designated lectoholotype and the female from the same place, lectoallotype. They are in the E. D. Ball Collection in the U.S. National Museum, Washington, D.C.

Brachypterous Form

Like the long-winged form except front wings oval in shape, not reaching the tip of abdomen, and hind wings about half as wide as eye and about as long. Length ♂ 2 mm.; ♀ 2.5 mm.

Holomorphotype ♂, allomorphotype ♀ and numerous paramorphotypes, Douglas County, Kansas, Aug., 1945, R. H. Beamer. These types in the Snow Entomological Collections.

5. *Chloriona slossoni* (Ball)

Liburnia slossoni Ball, E. D., Can. Ent., Vol. 33, p. 231, 1903.
Stenocranus breviceps Dozier, Ohio Jour. Sci., 22, p. 76, 1922

The milky, light general coloring of this species, with its two parallel longitudinal dark stripes either side of median pronotal carina along with the dark longitudinal wing pattern, easily identifies it from most others. The original description is accurate and adequate with the exception of the male genitalia.

Genitalia of Male: Genital segment dark brown in color, long and narrow with flaring edges. In lateral view main portion of segment almost rectangular with indentation in posterior dorsal margin; anal segment with two unusually slim, almost straight, ventrally projecting hooks; aedeagus quite wide at base, strongly constricted at middle, gently tapered to apex. In very high magnifications several oddly shaped ridges on dorsal margin before tip; style widest at base, gently tapered to slightly dorsally bent apex, more nearly parallel-sided in ventral view, sharply narrowed on inner margin near apex.

This species was originally described by Doctor E. D. Ball from three female specimens taken at Biscayne Bay, Fla. Dozier's fifteen specimens were from Pascagoula, Miss. The thirty-three specimens in the Snow Collections are from Louisiana, Mississippi, Florida and Georgia, except one male from Nottawa, Mich., collected by Doctor Curtis Sabrosky.

A NEW SUBGENUS AND SEVERAL NEW SPECIES OF SCAPHYTOPIUS* (Homoptera-Cicadellidae)

LEON W. HEPNER
Lawrence, Kansas

In a recently completed taxonomic revision of the tribe *Scaphytopini* in America north of Mexico, one subgenus, nineteen species and three subspecies new to science were discovered. The subgenus, species and subspecies are described in this paper.

Vertanus, a New Subgenus of *Scaphytopius*

Crown broadly convex on each side of a sharp apex, irregular, sunken, unmarked band before eyes; forewings broad with wide costal cell and several strongly recurved veins to costa; clypeus long, much wider on basal third with a thin median carina on basal half, strongly sinuate at antennae; clypellus slender, slightly enlarged near apex and extending beyond normal curve of genae; lorae oval; lateral margins of genae convex, small pit at base of antennae. Type of subgenus *Scaphytopius* (*Vertanus*) *ulcus* n. sp.

Scaphytopius (*Vertanus*) *ulcus* n. sp.

A striking species unlike any other north of Mexico, with broad colorless band on crown and sharply carinate clypeus. Length: female 5.2 mm.; male 5 mm.

* Contribution from Department of Entomology, University of Kansas

Color: Crown with apical fifth mottled brown to fuscous, excepting wedge; broad irregular, colorless band across crown on apical third, remainder with vittae as follows: ivory along outer margin, broad brown, fuscous-margined vittae just inside this, with narrow ivory, fuscous-margined vitta just inside this, with narrow ivory, fuscous and white lines in that order before thin fuscous line on each side of median suture; slightly lighter in female. Pronotum with broad light and dark alternating vittae, the light ones lined with fuscous. Scutellum about same color as pronotum. Clypeus mottled brown and yellow on apical half, basal half brown on lateral margins, remainder black excepting white sharksmouth and irregular oblique broad white vitta from near sharksmouth to basal margin. Remainder of face mottled brown and yellow except for white vitta behind eye and dot near ocellus and antenna. Forewing semihyaline yellow, at least on disc of clavus, in apical cells, and along some of veins; remainder semihyaline white or colorless, excepting black clouded areas in clavus and especially in discal and anteapical cells, one conspicuous mark through outer anteapical to costal margin; distinct hyaline spot in posterior end on middle and outer anteapicals.

Structural Characteristics: Crown slightly over twice as long as width between eyes, anterior margin strongly convex on each side of a sharply pointed apex; concave on disc. Pronotum slightly over half as long as crown, two and one-fourth times as wide as length at middle, and three and one-half times length behind eyes, broadly concave on posterior margin. Clypeus about two and one-fourth times as long as width at antennae, sharp median carina on basal half and rather strong concavity on each side, lateral margins sinuate at antennae. Clypellus relatively stout, enlarged at apex. Face in lateral view strongly concave. Forewing with several vein-like marks in brachial cell, sometimes extra veins on clavus and six or seven strongly reflexed veins to costa.

Genitalia: Valve triangular, about two-thirds as long as greatest width, posterior margin slightly concave on each side of a sharply pointed apex. Aedeagus large, basal portion roughly cone-shaped with a large "U"-shaped apical portion about as long as base but about twice as wide. Plates short and truncate. Styles projecting mesally, about twice as long as basal width, large lobe on outer margin just before short, blunt, outward-projecting apical process.

Last ventral segment of female convex and converging on lateral margins; posterior margin with a distinct, blunt lobe on each side of a small median notch.

Types: Holotype ♂, allotype ♀ and 2 ♀ and 3 ♂ paratypes, Hidalgo, Tex., Dec. 28, 1945, R. H. Beamer, in the Snow Entomological Collections. Additional paratypes as follows: 3 ♀, 1 ♂, Brownsville, Tex., June 29, 1938, 1 pr., July 3, 1938, R. H. Beamer; 1 pr., Brownsville, Tex., May 25, 1939, D. J. and J. N. Knull; 1 pr., Progreso, Tex., July 1, 1938, R. H. Beamer; 1 ♂, Taxco, Mex., Aug. 22, 1936, W. E. Stone; 1 ♂, "Mex.", April 10, 1939.

Host Plants: The specimen labelled "Mex." was collected from cantaloup.

Comparative Notes: The white band on crown and carina on clypeus easily separate this species from any other. There is evidently much variation in the length of the crown, as one of the specimens from Mexico had a longer crown and the other a shorter one than the type, but the internal genitalia proved to be the same.

Scaphytopius (Cloanthanus) albifrons n. sp.

Resembles *loricatus* but smaller, lighter in color, and with long processes at apex of aedeagus. Length: female 4.1 mm.; male 3.9 mm.

Color: Crown mottled brown with light markings as follows: wedge, narrow line along anterior margin, three pairs of spots before eyes, the outer largest and the inner long and slender; two pairs of spots along posterior margin, a large pair next median suture and another pair behind eyes. Pronotum fulvous semihyaline with fuscous dots throughout except for distinct vittae. Scutellum yellow to dark fulvous with typical markings light. Face ivory to yellow with sometimes a few brown marks in area of sharksmouth and dots along lateral margins of genae, especially behind eyes; apex of clypellus black. Dark specimens from Florida lack all facial markings except black tip of clypellus; those collected in Texas in winter usually have the facial markings. Forewing fulvous semihyaline with brown veins and large milky aeroles throughout. In most specimens from Florida, the fulvous is replaced by brown to black.

Structural Characteristics: Crown one and two-thirds as long as width between eyes in female, somewhat shorter in male, slightly convex on outer margins, rather sharply pointed at apex, especially in female. Pronotum about three-fifths as long as crown in female, slightly longer in male, almost three times as wide as length at middle and four times length behind eye. Clypeus over twice as long as width at ocelli, lateral margin broadly concave near middle. Clypellus broadest near apex. Face in lateral view slightly concave between anterior margin of eyes. Forewing with outer claval vein approaching second claval vein at cross-vein, usually numerous vein-like markings in brachial cell, about ten recurved veins to costa.

Genitalia: Valve almost as long as greatest width, posterior margin rounded, anterior margin narrowed to a broadly rounded lobe at middle. Plates wide near base, apical portion relatively short and slender. Aedeagus "J"-shaped, shaft longer than base, broadly curved, almost parallel-margined with a pair of long slender, apical processes, almost two-thirds as long as shaft. Styles about twice as long as the greatest width, outer margin concave on basal third, small lobe before finger-like process on apical third.

Last ventral segment of female slightly less than twice as wide as length at middle, lateral margins slightly convex, posterior margin evenly produced, but only slightly longer at middle than at sides.

Types: Holotype ♂, allotype ♀, 24 ♀ and 9 ♂ paratypes, Brownsville, Tex., Dec. 27, 1945, R. H. Beamer, in the Snow Entomological Collections. Additional paratypes as follows: (Tex.) 1 ♀, 3 ♂, Brownsville, Jan. 2, 1932, 1 ♂, Jan. 3, 1932, 1 ♂, Jan. 3, 1932, E. D. Ball; 7 ♀, 8 ♂, Brownsville, May 31, 1933, P. W. Oman; 11 ♀, Brownsville, Dec. 29, 1945, (in palm grove),

R. H. Beamer; 1 ♂, Brownsville, Aug. 8, 1937, D. J. and J. N. Knull; 2 ♀, 1 ♂, Cameron Co., Aug. 3, 1928, R. H. Beamer; 1 ♂, Hidalgo, July 30, 1938, 19 ♀, 1 ♂, Dec. 28, 1945, R. H. Beamer; 1 ♀, Hidalgo, July 28, 1928, A. M. James. (Florida) 1 ♀, Wakulla, July 10, 1939, R. H. Beamer; 1 ♂, Fruitland, Aug. 11, 1930, R. H. Beamer; 2 ♂, Sanford, Nov. 18, 1926, 1 ♂, June 22, 1926, E. D. Ball; 4 ♀, 1 ♂, Tampa, Oct. 17, 1925, E. D. Ball; 1 ♀, Cocoa, May 5, 1926, E. D. Ball; 1 ♀, La Belle, July 16, 1939, R. H. Beamer; 2 ♀, La Belle, July 16, 1939, P. W. Oman; 1 ♀, La Belle, July 16, 1939, P. B. Lawson; 1 ♂, La Belle, April 21, 1921, D. M. DeLong; 1 ♂, Likely, July 24, 1934, R. H. Beamer; 1 ♂, Naples, May 14, 1928, E. D. Ball; 1 pr., Miami Beach, Sept. 10, 1938, P. W. Oman; 2 ♂, Miami, April 1, 1921, D. M. DeLong; 1 ♂, Homestead, May 16, 1926, E. D. Ball; 1 ♀, Paradise Key, April 8, 1921, D. M. DeLong.

Host Plants: No host plants are known.

Comparative Notes: This is apparently the only species in Florida in which the face is entirely light. In Texas, however, this species is easily confused with *loricatus* and *pennatus*, but the male genitalia easily separate them. *Albifrons* was described by DeLong (1943) as *loricatus* but that species, described from California, extends only into Texas, and this species, distinctly different, is found no further west than Texas.

***Scaphytopius (Cloanthanus) pennatus* n. sp.**

Resembles *loricatus* but slightly smaller, larger markings on crown and wing-like processes at apex of aedeagus. Length: female 4 mm.; male 3.8 mm.

Color: Crown dark brown to fuscous, except for light markings as follows: narrow line along anterior margin, wedge, two pairs of large spots forming an incomplete band before eyes, a pair of large spots at base next median suture and a smaller pair next eyes. Pronotum same color as crown with vittae usually distinct. Face yellow with a few dark spots along lateral margins of genae and in area of sharksmouth; vitta behind eye sometimes faintly indicated. Forewing semihyaline fulvous with brown veins and irroration throughout, except for light aerole.

Structural Characteristics: Crown about one and two-thirds as long as width between eyes, slightly convex on each side of a bluntly pointed apex. Pronotum less than three-fourths as long as crown, about three times as wide as length at middle. Clypeus about twice as long as width at ocelli, margins slightly concave near base of antennae. Face broadly convex in lateral view, except for slight concavity between anterior margin of eyes. Forewing with typical venation in clavus, several vein-like marks in brachial cell and about ten recurved veins to costa.

Genitalia: Valve almost as long as greatest width, posterior margin rounding to a blunt point; anterior margin concave on each side of a broad, rounded median lobe. Plate relatively broad near base, apical portion relatively short and slender. Aedeagus roughly "L"-shaped, shaft almost parallel-margined to a pair of wing-like processes at apex; base almost as

long as shaft. Styles about twice as long as the greatest width, almost parallel-margined to lobe on outer margin before finger-like process on apical third.

Last ventral segment of female slightly less than twice as wide as length at middle, lateral margins slightly convex; posterior margin slightly produced to a broad, oval, median lobe.

Types: Holotype ♂, allotype ♀, Brownsville. Tex., July 3, 1938, R. H. Beamer, in the Snow Entomological Collections. Paratypes as follows: (Texas) 1 ♂, Brownsville, July 1, 1938, R. I. Sailer; 1 ♂, Brownsville, June 29, 1938, R. H. Beamer; 1 ♂, Brownsville, June 29 1938, R. I. Sailer; 1 pr., Cameron Co., Aug. 3, 1928, L. D. Beamer; 1 ♀, Cameron Co., Aug. 3, 1928, R. H. Beamer; 1 ♂, Hidalgo Co., July 31, 1928, L. D. Beamer; 1 ♂, Hidalgo Co., July 28, 1928, A. M. James.

Host Plants: No host plant is known.

Comparative Notes: This species is apparently restricted to southern Texas. It is nearest *loricatus*, but has more distinct markings on crown and wing-like processes at apex of aedeagus.

***Scaphytopius (Cloanthanus) flavifrons* n. sp.**

Resembles *pennatus* but broader and with longer apical processes at apex of aedeagus. Length: female 4 mm; male 3.8 mm.

Color: Crown dark brown with light marks as follows: wedge, two spots on each side of wedge along anterior margin, the one nearest eye smallest; a spot on each side of median suture on disc; on posterior margin a large spot on each side of median suture and a smaller one next each eye. Pronotum light brown with many fuscous dots throughout; typical light vittae indicated. Scutellum ivory to yellow with dark color restricted primarily to basal half. Face bright yellow, sometimes flecked on clypeus and outer margins of genae; much lighter than venter. Forewings translucent brown and white, the white primarily restricted to aeroles in the male; darkest on outer antepical cell and adjacent area of costa.

Structural Characteristics: Crown about one and one-half times as long as width between eyes, margins convex on each side of rounded apex. Pronotum about three-fourths length of crown, about two and one-half times as wide as length at middle and four and one-half times length behind eyes. Clypeus about twice as long as width at ocelli, slightly sinuate at antennae. Clypellus broadest near apex. Face distinctly convex in lateral view. Forewing with ten to twelve recurved veins to costa and often extra cross veins in clavus.

Genitalia: Valve about as long as greatest width, posterior margin distinctly convex on each side of bluntly-pointed apex; anterior margin with long, slender, median lobe. Aedeagus roughly "L"-shaped, dorsal part broadest but slightly shortest, shaft slightly curved near base, a pair of pointed apical processes, each about two-fifths length of shaft. Styles about two and one-half times basal width, distinct lobe on outer margin before outwardly projecting, finger-like, apical process.

Last ventral segment of female about twice as wide as length at middle, lateral margins convex; posterior margin convex, slightly lobed at middle.

Types: Holotype ♂, Brownsville, Tex., May 25, 1939, D. J. and J. N. Knull, in the Knull Collection, Ohio State University, Columbus, Ohio. Allotype ♀, Brownsville, Tex., Dec. 29, 1945, R. H. Beamer, in the Snow Entomological Collections. One ♀ paratype, Cameron Co., Tex., Aug. 3, 1938, R. H. Beamer.

Host Plants: No host plant is known.

Comparative Notes: This species is apparently restricted to the extreme southern part of Texas and is relatively rare. Its broadness and distinct genitalia separate it from any other species in the area.

***Scaphytopius (Cloanthanus) contractus* n. sp.**

Resembles *loricatus*, but lighter in color, shorter crown and small paraphyses. Length: female 4.1 mm.; male 3.8 mm.

Color: Crown white with an irregular, broad band across middle and a few thin lines on each side of wedge, yellow to brown. Pronotum a dark greenish-fulvous with light vittae distinct and sometimes irregularly bordered with dark dots. Scutellum same color as pronotum, or slightly lighter, with light markings distinct. Face yellow, narrow white line along margin between ocelli; slightly tawny behind eye, except for short, faint vitta; apex of clypellus black.

Structural Characteristics: Crown about one and two-third times as long as width between eyes, lateral margins convex on each side of a bluntly pointed apex. Pronotum only slightly shorter than crown, two and one-half times as wide as length at middle and five times as wide as length behind eyes. Clypeus about twice as long as width between ocelli and, except for being slightly sinuate at antennae, evenly narrowed to clypellus. Face convex in lateral view. Forewings with vein-like markings in brachial cell and about ten recurved veins to costa.

Genitalia: Valve almost as long as greatest width, posterior margin oval; anterior margin concave on each side of a blunt, narrow, median lobe. Plates relatively slender, broadest on basal third. Small, short paraphyses, barely extending to apex of valve. Aedeagus almost parallel-margined throughout, consisting of a basal, stem-like part, a short, simple, slightly curved shaft and an apical part about as long as basal part but curved at a right angle on middle. Styles somewhat over twice as long as basal width, "dog-legged" and almost parallel-margined on middle, slightly lobed on outer margin at apical fourth before finger-like apical process.

Last ventral segment of female slightly less than twice as wide as length at middle, lateral margins slightly concave, posterior margin produced at middle with a shallow median notch.

Types: Holotype ♂, allotype ♀, and 1 ♀ paratype, Brownsville, Tex., June 29, 1938, R. H. Beamer, in the Snow Entomological Collections. One other ♂ paratype, Brownsville, Tex., June 29, 1938, L. W. Hepner.

Host Plants: No host plant is known.

Comparative Notes: This species, evidently restricted to southern Texas, is quite distinctive with its yellow face and short aedeagus with short, small, genital paraphyses.

Scaphytopius (Cloanthanus) brunneus n. sp.

Resembles *loricatus* but lighter, darker on lateral margins of face and with small genital paraphyses. Length: female 4 mm.; male 3.7 mm.

Color: Crown brown with light markings as follows: narrow line along anterior margin; wedge and a pair of oblique lines on each side; three pairs of markings on a band before eyes, the median pair longest; two pairs of spots on posterior margin, one next each eye and one on each side of median suture, the median pair often split anteriorly. Pronotum about same color as crown with typical vittae evident. Scutellum brown with typical light markings. Clypeus, lorae and clypellus yellow to fulvous with white sharksmouth; irregular area along margin between eyes and irregular light markings in area of sharksmouth, brown; apex of clypellus dark. Genae with numerous dark irrorations, vitta behind eye irregular but distinct. Forewing semihyaline fulvous with milk acroles and brown irrorations; veins brown, becoming fuscous on apex and costa.

Structural Characteristics: Crown about one and one-third as long as width between eyes, longer in female, anterior margin almost straight on each side of a blunt apex; wedge about one-fourth length of crown. Pronotum about three-fourths as long as crown, shorter in female, about two and one-half times as wide as length at middle and about four times as wide as length behind eyes. Clypeus over twice as long as width at ocelli, practically no constriction at antennae. Clypellus relatively slender and somewhat enlarged near apex. Face in lateral view almost straight in male, definitely concave between anterior margin of eyes in female. Forewing with several vein-like markings in brachial cell and eight or nine recurved veins to costa.

Genitalia: Valve somewhat shorter than greatest width; posterior margin convex on each side of a bluntly pointed apex; anterior margin with relatively long median lobe. Plates short and very broad near base. Aedeagus in lateral view, broad, roughly "U"-shaped dorsal part shortest, shaft broad and short, enlarged at apex. Paraphysis very small and short, hardly reaching to apex of shaft of aedeagus. Styles about three times as long as basal width, relatively large lobe on outer margin just before slender, finger-like apical process.

Last ventral segment of female about twice as wide as length at middle, lateral margin convex, posterior margin with small lobe at each side and broad median lobe.

Types: Holotype ♂, allotype ♀, and a pair of paratypes, Paradise Key, Florida, April 9, 1921, D. M. DeLong, in the DeLong collection, Ohio State University, Columbus, Ohio. Additional paratypes as follows: 2 ♀, Key Largo, Fla., July 19, 1939, R. H. Beamer.

Host Plants: No host plant is known.

Comparative Notes: The only species with which this might be confused in southern Florida is *albifrons*, from which it is separated by marginal infuscation on face and the small paraphyses.

***Scaphytopius (Cloanthanus) fuscifrons minutus* n. subsp.**

Resembles *compactus*, but smaller, with basal area of crown light and with distinct light band across forewing. Length: female 4 mm.; male 4 mm.

Color: Crown brown except for ivory to yellow markings as follows: wedge, narrow area next pronotum, more or less distinct band before eyes, and narrow line along anterior margin. Pronotum brown irrorate with fulvous, more or less broad milky area along posterior margin; vittae very indistinct or absent, except near lateral margins. Scutellum ivory to yellow, large brown spot near each basal corner and sometimes indistinct irrorations between these. Face reddish-brown, approaching black on lateral margins of genae and near sharksmouth; small, light irrorations throughout, larger light spot along margin of genae next lower part of lorae, on disc of lorae sclerites and on disc of clypeus near apex; a light vitta behind eye, a shorter one near ocellus and another near base of antenna; sharksmouth small but distinct; basal margin light. Forewing milky semihyaline with black markings on basal half and in anteapical and apical cells, leaving a distinct light band across second cross-vein and across apices of anteapical cells, giving a distinct two-banded appearance, more distinct in males, which are usually slightly darker; veins dark throughout.

Structural Characteristics: Crown about one and one-third times as long as width between eyes, margins slightly convex; wedge about one-fourth length of crown. Pronotum about three-fourths as long as crown, about three times as wide as length at middle and four and one-half times as wide as length behind eyes. Clypeus almost twice as long as distance between ocelli, only slightly sinuate, if any, at antennae. Clypellus widest near apex. Face convex in lateral view, although slightly concave between anterior margin of eyes. Forewing with claval veins joining or almost joining; eight or ten more or less distinct cross-vein like markings in brachial cell and about twelve recurved veins to costa.

Genitalia: Valve about four-fifths as long as greatest width, oval on median half of posterior margin, broadly truncate on median half of anterior margin. Plates short, bluntly pointed. Paraphysis only slightly broadened toward sharp apex. Aedeagus short, smallest at base, broadest just before blunt apex. Styles about two and one-half times as long as basal width, sinuate on basal fourth, slightly lobed on outer third to a parallel margined apical process.

Last ventral segment of female about three times as wide as greatest length; irregularly lobed on each side of a relatively long, parallel-margined median notch.

Types: Holotype ♂, allotype ♀, and 6 ♀ and 7 ♂ paratypes, Miami, Arizona, Aug. 6, 1941, R. H. Beamer, in the Snow Entomological Collections. Additional paratypes as follows: (Ariz.) 1 ♂, Yarnell Hts., Oct. 8, 1929, 1 ♀, July 21, 1929, E. D. Ball; 4 ♀, 2 ♂, Pinal Mts., July 7, 1936, E. D. Ball; 1 ♀,

Santa Catalina Mts, July 30, 1930, E. D. Ball; 1 ♂, Santa Rita Mts., June 16, 1933, P. W. Oman; 1 pr., Douglas, June 10, 1936, E. D. Ball; (Tex.) 1 ♀, Concan, July 6, 1936, R. H. Beamer; 1 ♂, Chisos Mts., Sept. 19, 1938, D. J. and J. N. Knull.

Host Plants: Ball's reference (1932) to *compactus* in Arizona probably referred to this species, as some of his specimens were labelled "*Cconothus*."

Comparative Notes: The specimens from Texas are somewhat smaller than those from Arizona, but appear to be the same thing. It is easily separated from *compactus* by its smaller size and more light color on crown and face.

***Scaphytopius (Cloanthanus) californiensis* n. sp.**

Resembles *irroratus* but lighter, larger, with larger spots on crown, and with short genital paraphyses. Length: female 4.2 mm; male 3.8 mm.

Color: Crown with fuscous areas around wedge and between anterior part of eyes, remainder fulvous except for following light markings. wedge, thin line along anterior margin, three pairs of spots before eyes, the median pair greatly elongated and joining a pair of spots on posterior margin next median suture. Pronotum semihyaline milky to fulvous with irrorations throughout, vittae usually indicated. Scutellum orange with typical light markings usually lined with fuscous. Face fulvous with brown irrorations throughout, usually slightly darker along lateral margins and lightest on lorae; sharksmouth and vitta behind eye usually fairly distinct. Forewing semihyaline milky to pale fulvous with veins and numerous dots, forming aeroles throughout; dark areas on costa and adjoining anteapical cell.

Structural Characteristics: Crown of male about one and one-half times as long as width between eyes, slightly longer in female, margins slightly convex in male, almost straight in female. Pronotum about three-fourths as long as crown, almost two and one-half times as wide as length at middle. Clypeus slightly more than twice as long as width at ocelli, slightly sinuate near antennae. Clypellus relatively slender, widest near apex. Face in lateral view convex, slightly concave between anterior margin of eyes in female. Forewing with venation typical, about ten recurved veins to costa.

Genitalia: Valve almost as long as greatest width, posterior margin convex on each side of a bluntly pointed apex; anterior margin with a relatively long median lobe. Paraphyses joined on basal two-thirds, apices free and sharply pointed. Shaft of aedeagus short, curved, only slightly narrower at apex than at base. Styles only about twice as long as basal width, distinct lobe on outer margin just before outward-projecting, finger-like, apical process.

Last ventral segment of female slightly over half as long as greatest width, lateral margins slightly converging; posterior margin straight with exception of small, broad, median lobe.

Types: Holotype ♂, allotype ♀, and 21 ♀ and 10 ♂ paratypes, Ventura, Calif., July 20, 1933, R. H. Beamer, in the Snow Entomological Collections. Additional paratypes as follows: (Calif.) 1 ♀, Fresno, May 20, 1898; 3 ♀, Monterey, July 22, 1935, R. H. Beamer; 1 ♀, Three Rivers, June 9, 1935,

P. W. Oman; 8 ♀, 2 ♂, Claremont, July 29, 1935, R. H. Beamer; 1 ♂, Claremont, July 29, 1935, Jack Beamer; 1 ♀, Topango Canyon, Aug. 5, 1938, L. W. Hepner; 3 ♀, 7 ♂, Topango Canyon, Aug. 5, 1938, R. H. Beamer; 2 ♂, Anza, July 29, 1938, R. H. Beamer; 1 ♂, Arroyo Seco River, Aug. 8, 1938, R. H. Beamer; 1 pr., San Gabriel Canyon, July 2, 1935, R. H. Beamer; 1 pr., Lompoc, Aug. 9, 1938, R. H. Beamer; 1 ♀, Lompoc, Aug. 9, 1938, R. I. Sailer; 1 ♀, Santa Ana Canyon, July 30, 1932, R. H. Beamer; 2 ♀, Ontario, April 21, 1908; 1 ♀, Strawberry, Aug. 8, 1929, R. H. Beamer; 1 ♀, Mint Canyon, July 6, 1933, R. H. Beamer; 2 ♀, Nipomo, July 24, 1935, R. H. Beamer; 3 ♀, 1 ♂, Beaumont, June 12, 1931, E. D. Ball; 1 ♂, Los Angeles, Uhler; 1 ♂, Mint Canyon, June 7, 1935, P. W. Oman; 1 ♀, 2 ♂, Ontario, Oct. 21, 1938, Christensen; 2 prs., Hemet, Oct. 26, 1938, Christensen; 1 ♀, Lindsay Hts., Dec. 19, 1938, E. A. McGregor; 4 ♀, 2 ♂, San Diego, Aug. 7, 1935, 2 ♀, July 24, 1941, R. H. Beamer; 9 ♀, 3 ♂, San Diego, July 5, 1931, E. D. Ball; 1 ♂, Escondido, July 15, 1941, R. H. Beamer; 1 ♀, 2 ♂, La Jolla, July 13, 1941, R. H. Beamer; 1 ♀, Palm City, Aug. 7, 1935, R. H. Beamer; 2 ♀, 1 ♂, Alpine, July 5, 1931, E. D. Ball; 2 prs., Long Beach, July 4, 1931, E. D. Ball.

Host Plants: Specimens were collected in 1938 on *Arctastaphylae glauca* and *A. vaccaensis*, but these plants may have been only a resting place for them.

Comparative Notes: This species is restricted to southern California, somewhat resembles *nogalinus*, but has a longer, sharper, darker crown and quite different genitalia.

***Scaphytopius (Cloanthanus) pallidiscutus* n. sp.**

Resembles *diabolus* but larger, with a longer crown, scutellum lighter colored, and with longer aedeagus. Length: female 4.5 mm.; male 4.5 mm.

Color: Crown black with white marks as follows: a thin line along anterior margin; wedge and a line on each side parallel to margin; an almost complete, broad irregular band before eyes; and two pairs of spots along posterior margin, one pair next eyes and another next median suture—basal fifth with black replaced by fulvous or brown except for a few lines. Pronotum gray with scattered dark spots; irregular light vittae usually faintly indicated. Scutellum light fulvous to brown with typical light markings; sometimes almost entirely ivory. Face evenly reddish-brown, mottled throughout, much more unicolorous than *diabolus*, except for fuscous tip of clypellus, irregular black markings below small sharksmouth, light vitta behind eye and shorter one near ocellus.

Structural Characteristics: Crown about one and two-third times as long as width between eyes, almost straight margined on each side of a bluntly pointed apex; wedge about one-fifth length of crown. Pronotum about two-thirds as long as crown, about two and one-half times as wide as length at middle, and four and one-half times length behind eye. Clypeus over twice as long as width at ocelli, slightly sinuate at antennae; a depression, almost parallel to basal margin, on each side before eye. Clypellus broadest just before apex. Face in lateral view concave between anterior

margin of eyes. Forewing with two or three cross-veins connecting claval veins; usually ten or more marks or cross-veins in brachial cell and about ten recurved veins to costa.

Genitalia: Valve about four-fifths as long as greatest width, posterior margin convex on each side of a bluntly pointed apex, anterior margin evenly rounded. Paraphysis almost twice as long as styles, largest near base, almost parallel-margined to sharp apex, except for constriction near outer third. Shaft of aedeagus slender, about one-half as long as styles, evenly narrowed to a pair of short, dorsal, apical processes. Styles almost four and one-half times as long as greatest width, slightly constricted on basal third, distinct lobe on outer margin before long, slender process on apical half.

Last ventral segment of female somewhat less than twice as wide as length at middle, slightly concave on lateral margins, then rounded to a small median notch at middle on posterior margin; more truncate than *diabolus*.

Types: Holotype ♂, allotype ♀, and 12 ♀ and 8 ♂ paratypes, Boulevard, Calif., July 26, 1938, R. H. Beamer, in the Snow Entomological Collections. Additional paratypes from California as follows. 1 ♂, Santa Rosa, Aug. 16, 1938, R. H. Beamer, 3 ♀, Santa Cruz Mts., Aug. 13, 1938, R. I. Sailer; 1 ♀, Jamesburg, Aug. 11, 1938, R. H. Beamer; 1 ♀, Lockwood, July 24, 1935, R. H. Beamer; 1 ♀, Lompoc, Aug. 9, 1938, R. I. Sailer, 1 ♀, 2 ♂, Beaumont, June 12, 1931, E. D. Ball; 1 ♂, Big Bear Lake, July 26, 1932, R. H. Beamer, 2 ♀, 1 ♂, Topango Canyon, Aug. 5, 1938, R. H. Beamer; 1 ♀, Topango Canyon, Aug. 5, 1938, R. I. Sailer; 1 ♀, Topango Canyon, Aug. 5, 1938, L. W. Hepner, 1 ♀, Claremont, July 29, 1935, R. H. Beamer; 12 ♀, 13 ♂, Pine Flats Camp, Indio, July 12, 1941, R. H. Beamer; 1 ♀, Jacumba, July 17, 1940, R. H. Beamer; 7 ♀, 3 ♂, Campo, Aug. 10, 1935, R. H. Beamer, 3 ♀, Pine Valley, July 27, 1938, 1 ♀, July 18, 1941, R. H. Beamer; 3 ♀, Warner Springs, July 28, 1938, R. H. Beamer, 1 ♀, San Diego Co., July 4, 1929, P. W. Oman.

Host Plants: Specimens have been collected in southern California from *Ceanothus greggii purplexans* and *C. cuneatus* and *Arctostaphyleae pungens* and *A. glauca*, so it is possible that one of these is the host of this species.

Comparative Notes: This species is similar to *diabolus*, but can be easily separated by the lighter scutellum, lighter and more evenly colored face and the longer aedeagus of the male. The female last ventral segment of this species is more truncate than that of *diabolus*. This species is evidently restricted to California.

***Scaphytopius (Cloanthanus) deltensis* n. sp.**

Resembling *fuscifrons*, but with pointed plates in male and last ventral segment of female produced at middle. Length: female 4.8 mm; male 4.4 mm.

Color: Crown irregularly mottled fuscous and ivory, lightest along anterior margin. Pronotum about same color as crown, vittae evident only on lateral margins. Scutellum dark brown, with typical white markings and usually a large orange area near each basal corner. Face fuscous and light

mottled; vitta behind eye, shorter ones near ocelli and antennae and long sharksmouth, light. Forewings semihyaline white, fuscous vermiculations throughout, darkest on apical cells, darkest in male; veins fuscous, becoming black on costa.

Structural Characteristics: Crown only slightly longer at middle than next eyes; about as long as width between eyes, anterior margin convex on each side of a very bluntly pointed apex; wedge about one-third length of crown. Pronotum somewhat longer than crown, about two and one-fourth times as wide as length at middle and three and one-half times length behind eyes. Clypeus somewhat less than twice as long as width at ocelli, only slightly constricted at antennae. Clypellus relatively stout, slightly enlarged near apex. Face in lateral view strongly convex. Forewing with several vein-like marks in brachial cell, about twelve recurved veins to costa and sometimes extra cross-veins in clavus.

Genitalia: Valve somewhat shorter than greatest width, posterior margin almost straight on each side of a rounded apex; anterior margin with broad, short, median lobe. Paraphysis bulbed at base, slender and completely spiraled on middle, and enlarged before sharp apex. Aedeagus curved near base, gradually narrowing to blunt apex, with small teeth on dorsal margin. Styles about three times as long as width at base, somewhat sinuate near middle, distinct lobe on outer margin just before finger-like, apical process.

Last ventral segment of female about as long as greatest width, lateral margins straight and converging; posterior margin convex except for small median notch.

Types: Holotype ♂, allotype ♀, 7 ♀, 1 ♂ paratype, Delta, California, June 28, 1935, P. W. Oman, in the National Museum, Washington, D.C. Additional paratypes as follows: 1 ♀, Mt. Shasta, June 29, 1935, P. W. Oman; 8 ♀, Delta, June 28, 1935, R. H. Beamer.

Host Plants: No host plant is known.

Comparative Notes: This species is much like *fuscifrons*, but the genitalia easily separate it from that species.

***Scaphytopius (Cloanthanus) amplinotus* n. sp.**

Resembles *verecundus*, but larger, with large white spots throughout, and with lateral projection near apex of genital paraphysis. Length: female 4.6 mm.; male 4 mm.

Color: Crown orange-fulvous with white markings as follows. thin line on anterior margin; wedge and oblique line on each side; three pairs of spots across crown before eyes, the median pair about size of wedge; on posterior margin a large spot at middle and a smaller spot next each eye. Pronotum same color as crown with irregular white vittae distinct and sometimes quite broad. Scutellum same color as crown, with typical light markings and irregular markings, especially on disc, white. Genae and clypeus fulvous to yellow; area next lorae, vitta behind eye and shorter ones near antennae and ocelli, white. Forewings semihyaline orange-fulvous with large white areas throughout; veins dark on apical half and on costa.

Structural Characteristics: Crown about twice as long as width between eyes, anterior margin almost straight to a pointed apex. Pronotum about three-fourths as long as crown, about two and one-half times as wide as length at middle and three and one-half times length behind eye. Clypeus over twice as long as width at ocelli, slender, only slightly constricted, if at all, at antennae. Clypellus slender and slightly enlarged near apex. Forewing usually with claval veins nearest each other at cross-vein, several vein-like marks in brachial cell and about ten recurved veins to costa.

Genitalia: Valve about as long as greatest width, posterior margin convex on each side of a pointed apex; anterior margin broadly rounded. Paraphysis slender on basal four-fifths, enlarged, with a short lateral process, just before sharply pointed apex. Shaft of aedeagus in ventral view almost parallel-margined, in lateral view, long, slender, slightly curved and without processes. Styles slightly over three times as long as basal width, sinuate just beyond basal third, slightly enlarged on outer margin just before finger-like, apical process.

Last ventral segment of female with latero-posterior margin broadly rounded and with a short, broad median lobe.

Types: Holotype ♂, allotype ♀, and 3 ♀ and 26 ♂ paratypes, Hudson, Florida, July 13, 1939, R. H. Beamer, in the Snow Entomological Collections. Additional paratypes as follows. (Fla.) 2 ♀, 1 ♂, Hudson, July 13, 1939, P. B. Lawson; 13 ♀, 19 ♂, Hudson, July 13, 1939, P. W. Oman; 2 ♀, Likely, July 24, 1934, R. H. Beamer; 1 ♀, 2 ♂, Lacoochee, Aug 18, 1930, R. H. Beamer; 1 ♂, Eustis, Oct 12, 1932, J O Pepper; 1 ♂, Old Town, July 11, 1939, P. B. Lawson; 1 ♂, Sanford, July 12, 1928, E D. Ball. (Ga.) 1 pr., Okefenokee Swamp, July 25, 1939, 7 ♀, 1 ♂, July 27, 1939, 2 ♀, 6 ♂, Aug 3, 1934, R. H. Beamer.

Host Plants: The host plant is not known.

Comparative Notes: This species is the only one in this country with large white, unmarginated spots covering the entire dorsum.

Scaphytopius (Cloanthanus) insolitus n. sp.

Resembles *verecundus* somewhat, but smaller, with shorter crown and with genital paraphyses lobed. Length. female 3.4 mm.; male 3 mm.

Color: Crown mottled reddish, with light markings as follows: thin wedge, three pairs of long marks in band before eyes, the median pair often united with a pair of spots near median suture on posterior margin. Pronotum, scutellum and face more or less mottled reddish-fulvous, sharksmouth indicated. Forewing translucent dark fulvous, becoming fuscous on costal and apical margins.

Structural Characteristics: Crown about one and one-half times as long as width between eyes, anterior margin almost straight on each side of a pointed apex. Pronotum about four-fifths as long as crown, two and one-third times as wide as length at middle and four and one-half times length behind eyes. Clypeus twice as long as width at ocelli, somewhat sinuate at

antennae. Clypellus broad and only slightly enlarged at apex. Face somewhat convex in lateral view. Forewing with venation typical, vein-like marks in brachial cell and about ten recurved veins to costa.

Genitalia: Valve somewhat wider than length at middle, posterior margin bell-shaped, anterior margin with large lobe on median half. Aedeagus in lateral view straight, converging toward blunt apex, toothed along dorsal margin. Paraphysis slender on basal two-thirds, somewhat enlarged toward apex with a small, pointed lateral lobe. Styles about two and one-half times as long as basal width, somewhat sinuate on basal fourth, slightly lobed on outer margin before finger-like process on apical third.

Last ventral segment of female about three-fifths as long as greatest width, latero-posterior margin rounded.

Types: Holotype ♂, allotype ♀, Sanford, Fla., June 17, 1927, E. D. Ball, in the National Museum, Washington, D.C.

Host Plants: The host plant is not known.

Comparative Notes: This small species, reddish and distinctively marked, is evidently rare, as only the one pair is known.

***Scaphytopius (Cloanthanus) scriptus meridianus* n. subsp.**

Resembles *scriptus* but lighter color, longer crown and more southern in distribution. Length: female 4.7 mm; male 3.8 mm.

Color: Crown mottled brownish, with light markings as follows: wedge; circular area on apical half, broken by three lines behind wedge; irregular area along posterior margin. Pronotum pale fulvous, irregularly marked with brown, vittae only lightly indicated. Scutellum fulvous with typical markings indicated. Face fulvous, mottled with brown, light sharksmouth and vitta behind eye, evident. Forewing semihyaline fulvous, veins and irrorations fuscous in male, fulvous in female.

Structural Characteristics: Crown slightly less than twice as long as width between eyes, anterior margin straight to slightly convex on each side of a pointed apex. Pronotum about three-fourths as long as crown, about two and one-third times as wide as length at middle and three and one-half times length behind eyes. Clypeus slightly over twice as long as width at ocelli, slightly, if any, sinuate at antennae. Clypellus broad, enlarged and rounded at apex. Face in lateral view straight in male, slightly concave between anterior margin of eyes in female. Venation typical, vein-like marks in brachial cell and about ten recurved veins to costa.

Genitalia: Valve almost as long as greatest width, posterior margin bell-shaped; anterior margin with broad, short lobe on median third. Shaft of aedeagus in lateral view slightly curved, almost parallel-margined to blunt apex, rugulose area on dorsal margin near apex. Paraphysis slender on basal two-thirds, coiled near middle, slender lateral process before enlarged, sharply pointed, apical portion. Styles about three times as long as basal width, slightly sinuate near middle, distinct lobe on outer margin before bluntly pointed, finger-like, apical process.

Last ventral segment of female slightly more than half as long as greatest width, latero-posterior margin rounded.

Types: Holotype ♂, allotype ♀, 2 ♂ and 1 ♀ paratype, Branford, Fla., July 31, 1930, R. H. Beamer, in the Snow Entomological Collections. Additional paratypes as follows: 1 ♀, Ft. Mead, Aug. 13, 1930, L. D. Tuthill; 4 ♀, 1 ♂, Ft. Mead, Aug. 13, 1930, R. H. Beamer; 2 ♀, Ft. Mead, Aug. 13, 1930, P. W. Oman; 3 ♀, 2 ♂, Hilliard, July 28, 1934, M. E. Griffith; 1 pr., Hilliard, Aug. 31, 1930, L. D. Tuthill; 1 pr., Hilliard, Aug. 9, 1930, John Nottingham; 1 ♂, Hilliard, July 28, 1934, 1 ♀ Aug. 31, 1930, R. H. Beamer; 2 ♂, Hilliard, Aug. 19, 1930, P. W. Oman; 1 ♂, Waldo, Aug. 18, 1930, R. H. Beamer; 1 ♀, Wildwood, Aug. 2, 1930, John Nottingham; 5 ♀, 3 ♂, Suwanee Spps., Aug. 2-3, 1939, R. H. Beamer; 1 ♂, Pensacola, July 12, 1934, R. H. Beamer. (Ga.) 2 ♀, Okefenokee Swamp, July 27, 1939, 1 ♀, Aug. 3, 1934, R. H. Beamer. (La.) 1 ♂, "La", Carl F. Baker.

Additional specimens, somewhat larger, are on hand from Mississippi and Arkansas.

Host Plants: No host plant is known.

Comparative Notes: This subspecies might be confused with *verecundus* in Florida but lacks the red color, has a shorter crown and is easily separated by the male genitalia.

Scaphytopius (Cloanthanus) radiatus n. sp.

Resembles *loricatus* but lighter, with a dark face, different markings on crown and with genital paraphyses. Length: female 4 mm.; male 4 mm.

Color: Crown brown and white mottled, with the white markings giving the appearance of lines radiating toward the apex. Pronotum gray with fuscous markings; vittae evident, especially on sides. Scutellum dark orange to brown with typical light markings. Clypeus fulvous with brown irrorationes excepting small sharkmouth. Clypellus and lorae same as clypeus. Genae same as clypeus, darkest behind eye, light vitta behind eye and shorter ones near ocellus and antenna evident. Forewing semihyaline fulvous with white aeroles or areas, many brown vermiculations throughout, especially in male, darkest at apex and on costa.

Structural Characteristics: Crown slightly less than one and one-half times as long as width between eyes; anterior margin slightly convex on each side of a bluntly pointed apex; wedge about one-fifth length of crown. Pronotum somewhat shorter than crown, two and one-fourth times as wide as length at middle and about four times length behind eyes. Clypeus slightly more than twice as long as width at ocelli, only slightly sinuate, if at all, at antennae. Face in lateral view convex in male, concave between anterior margin of eyes in female. Forewing with typical venation; several vein-like marks in brachial cell and about nine recurved veins to costa.

Genitalia: Valve about as long as greatest width, posterior margin broadly convex on each side of a small teat-like process at apex; anterior margin with small lobe on median half. Paraphysis long, slender and almost parallel-margined to sharp apex. Aedeagus in lateral view roughly "L"-shaped, shaft longer but narrower than basal portion. Styles about four times as long as basal width, slender, with narrow, long lobe on outer margin before outwardly directed apical process.

Last ventral segment of female almost twice as wide as length at middle, lateral margins slightly convergent, posterior margin with small lobe at each side and a broader lobe on each side of a small median notch.

Types: Holotype ♂, allotype ♀, and 2 ♂ and 6 ♀ paratypes, Three Rivers, Tex., June 27, 1938, R. H. Beamer, in the Snow Entomological Collections. Additional paratype as follows: 1 ♂, Sinton, Tex., Dec. 25, 1945, R. H. Beamer.

Host Plants: The host plant is not known.

Comparative Notes: The brown crown, with light lines radiating toward apex, easily separates this species from any other in southern Texas. The male collected in December was darker, with shorter lineations on crown, but the genitalia were almost identical to the type series. From the description of *flavens* DeLong, this species differs in the markings on the crown and with many more marks on the forewing.

***Scaphytopius (Cloanthanus) modicus* n. sp.**

Resembles *magdalenensis*, but smaller, lighter in color, a different pattern on crown and greatly produced last ventral segment of female. Length: female 3.6 mm.; male 3.2 mm.

Color: Crown fulvous except for light markings as follows: short wedge; most of area before eyes; two pairs of spots along posterior margin, one next each eye and one on each side of median suture. Pronotum fulvous with anterior margin lightest; many brown irrorations in male, almost none in female; vittae evident. Scutellum fulvous to orange with typical light markings. Clypeus ivory to fulvous with dark dots, excepting small sharksmouth. Clypellus and lorae same as clypeus with less markings. Genae darker than clypeus with vitta behind eye and shorter ones near ocelli and antennae, distinct. Forewing fulvous with few dark markings.

Structural Characteristics: Crown almost one and one-half times as long as width between eyes, slightly convex on each side of a bluntly pointed apex; wedge very short. Pronotum almost as long as crown, about two and one-half times as wide as length at middle and four and one-half times length behind eyes. Clypeus slightly over twice as long as width at ocelli, very slightly sinuate at antennae. Clypellus slightly enlarged near apex. Face in lateral view distinctly convex in male, almost straight in female. Forewing with venation typical, several vein-like marks in brachial cell and about nine recurved veins to costa.

Genitalia: Valve about as long as greatest width, posterior margin convex on each side of a small median lobe; anterior margin with long bluntly pointed lobe. Plates very slender, concave on inner margin. Paraphysis relatively stout, slightly longer than plates, broadest on outer fifth before sharply pointed apex. Aedeagus in lateral view short, curved and parallel margined. Styles about twice as long as basal width, constricted near middle, lobed on outer margin before sharply pointed, outwardly projection, apical process.

Last ventral segment of female about two-thirds as long as greatest width, latero-posterior margin with very long, notched, median lobe.

Types: Holotype ♂, allotype ♀, Cameron Co., Tex., Aug. 3, 1923, R. H. Beamer, in the Snow Entomological Collections.

Host Plants: The host plant is not known.

Comparative Notes: This is one of the smallest species in southern Texas and the genitalia is quite distinctive—the slender plates, short styles and stout paraphyses of the male and the strongly produced last ventral segment of the female are unlike any other species in the area.

***Scaphytopius (Cloanthanus) pallidicapitatus* n. sp.**

Resembles *castranus* but darker, more distinct pattern on crown and with shorter aedeagus. Length: female 4 mm.; male 4 mm.

Color: Crown fulvous marked with brown; wedge, irregular band before eyes, and posterior margin without markings. Pronotum gray with sparsely spaced dark dots; vittae visible on lateral margins. Scutellum yellow to fulvous, darkest near basal corners. Face yellow to fulvous with sparsely spaced dots throughout, especially on lateral margins of genae; sharksmouth small; apex of clypellus only slightly darkened. Forewings semihyaline white, darkened posteriorly; veins brown, darkest on posterior and costal margins.

Structural Characteristics: Crown slightly longer than width between eyes, anterior margin slightly convex on each side of a blunt apex; wedge relatively small. Pronotum about as long as crown, almost two and one-half times as wide as length at middle and about five times length behind eyes. Clypeus slightly over twice as long as width at ocelli, slightly sinuate near antennae. Clypellus definitely constricted near base and enlarged near apex. Face in lateral view convex. Forewings with vein-like markings in brachial cell, about eleven recurved veins to costa and sometimes extra veins in clavus.

Genitalia: Valve about as long as greatest width, posterior margin distinctly convex on each side of a truncate lobe on median third. Plates slender. Paraphysis slender, extending slightly beyond apex of plates, apex pointed. Aedeagus in lateral view very short, slightly curved and parallel-margined. Styles about four times as long as basal width, almost parallel-margined to rounded outer margin before sharply pointed apical process.

Last ventral segment of female about twice as wide as length at middle, lateral margins slightly convergent, posterior margin rounded to a very small median notch.

Types: Holotype ♂, allotype ♀, and 3 ♂ and 2 ♀ paratypes, Mission, Tex., July 5, 1938, R. H. Beamer, in the Snow Entomological Collections. Additional paratypes as follows: (Tex.) 3 prs., 12 miles west of Mission, Dec. 26, 1945, R. H. Beamer; 1 pr., Hidalgo Co., July 30, 1928, R. H. Beamer; 2 ♀, Starr Co., July 30, 1928, 4 ♀, 2 ♂, July 5, 1938, R. H. Beamer; 1 ♀, Starr Co., July 30, 1928, L. D. Beamer.

Host Plants: The host plant is not known.

Comparative Notes: The very light crown, with speckled face, is distinctive. A specimen from Calcasieu Parish, Louisiana, is probably this species, but the abdomen is missing. This species is near *brevis* but the genitalia is somewhat different.

***Scaphytopius (Cloanthanus) vittifrons* n. sp.**

A distinctively marked species, with the fuscous-margined, light vitta from sharksmouth to apex of frons. Length: female 4.5 mm.; male 3.7 mm.

Color: Crown mottled fulvous to brown with broad, fuscous margined light vittae as follows: along anterior margin from eye to eye, wedge, along vitta on disc on each side of median suture and an irregular area along the median margin of each eye. Pronotum mottled yellow to fulvous with typical vittae distinct and dark-margined. Scutellum yellowish, darkest next each basal corner. Clypeus yellowish, mottled with brown, and with fuscous-bordered light marks as follows: line along basal margin joining ocelli, sharksmouth, vitta from near sharksmouth to apex. Clypellus and lorae same color as clypeus, but with fewer dark markings. Genae about same as clypeus, with fuscous-bordered light vittae as follows: behind eye, from apex of eye to lateral margin and next lorae. Forewings opaque white with irregular dark fulvous or light brown clouded areas covering about half of entire wing; veins darkening posteriorly and on costa.

Structural Characteristics: Crown about twice as long as width between eyes, longest in female, anterior margin almost straight on each side of a pointed apex; wedge about two-fifths length of crown. Pronotum about three-fourths as long as crown, proportionately shorter in female, twice as wide as length at middle and three and two-thirds times length behind eye. Clypeus over twice as long as width at ocelli, lateral margins sinuate at antennae. Clypellus only slightly enlarged near apex. Face in lateral view slightly concave between anterior margin of eyes. Forewing with a few vein-like marks in brachial cell and about ten recurved veins to costa.

Genitalia: Valve about three-fourths as long as greatest width, posterior margin convex on each side of a bluntly pointed apex; anterior margin with short, broad lobe. Paraphysis long, slender and sharply pointed. Aedeagus in lateral view short, curved and almost parallel margined. Styles almost four times as long as basal width, sinuate on basal third, small lobe on outer margin before long, slender processes on apical third.

Last ventral segment of female almost twice as wide as length at middle, lateral margin slightly convex; posterior margin almost straight except for small median lobe.

Types: Holotype ♂, Concan, Tex., July 6, 1936, R. H. Beamer, in the Snow Entomological Collections. Allotype ♀, Chisos Mts., Tex., Sept. 19, 1938, D. J. and J. N. Knull, in the Knull Collection, Ohio State University, Columbus, Ohio. One paratype ♀, El Paso Co., Tex., Aug. 30, 1940, D. J. and J. N. Knull.

Host Plants: The host plant is not known.

Comparative Notes: So far as known, this is the only species north of Mexico with the vitta on the middle of the clypeus, although there are several larger, similarly marked species in Mexico.

Scaphytopius (Cloanthanus) fuscicephalus n. sp.

Resembles *argutus* but with crown darkest on disc and aedeagus straight and parallel-margined in ventral view. Length: female 4.8 mm.; male 4.1 mm.

Color: Crown mottled fulvous and brown, darkest on disc; wedge light. Pronotum fulvous flecked with dark, vittae evident. Scutellum dark fulvous, darkest near basal corner, typical markings present. Face yellowish, slightly darker behind eye and along basal margin between ocelli, with dark-margined light markings as follows: sharksmouth, vitta behind eye and shorter one near ocellus. Forewings translucent brown, veins and many vermiculations, darker; white aeroles throughout.

Structural Characteristics: Crown about twice as long as width between eyes, anterior margin almost straight on each side of a sharply pointed apex; wedge about two-fifths length of crown. Pronotum about three-fifths as long as crown, two and one-fourth times as wide as length at middle and three and one-half times length behind eye. Clypeus slightly more than twice as long as width at ocelli, only slightly, if any, sinuate at antennae. Clypellus only slightly enlarged near apex. Face in lateral view concave between anterior margin of eyes. Forewings often with extra veins in clavus, vein-like markings in brachial cell and about ten recurved veins to costa.

Genitalia: Valve about three-fourths as long as greatest width, posterior margin bell-shaped; anterior margin with broad, short median lobe. Paraphysis long and slender and only slightly enlarged near apex. Aedeagus parallel-margined in ventral view; slightly curved near base in lateral view. Styles about two and one-half times as long as basal width, quite sinuate near middle, lobed on outer margin before finger-like process on apical third.

Last ventral segment of female almost twice as wide as median length, latero-posterior margin rounded.

Types: Holotype ♂, allotype ♀, Lawrence, Kansas, Sept. 4, 1941, L. W. Hepner, in the Snow Entomological Collections. Paratypes from Kansas as follows: 1 ♀, Douglas Co., July, 1926, E. L. Bales; 1 ♂, Douglas Co., Aug. 28, 1928, 1 ♂, Aug. 17, 1928, 1 ♂, June 21, 1928, P. B. Lawson; 4 ♀, Atchison Co., July 8, 1924, E. P. Breakey; 1 ♂, Cherokee Co., April 9, 1928, R. H. Beamer; 1 ♂, Coffeyville, June 15, 1939, 1 ♂, June 24, 1939, 1 ♂, July 16, 1939, L. W. Hepner.

Host Plants: No host plant is known.

Comparative Notes: Specimens were on hand from Texas and New Mexico which were evidently of this same species. It is separated from *argutus* by the different aedeagus and the much darker crown.

Scaphytopius (Cloanthanus) viridicephalus n. sp.

Resembling *slossonae* but with shorter, greenish crown, and darker male. Length: female 4.2 mm.; male 3.6 mm.

Color: Crown greenish-fulvous, especially in female, with wedge, long arcuate markings on disc and four pairs of large dots on posterior margin at least indicated. The male is often only faintly tinged with green, but may be distinguished from other species by the crown being much lighter than the forewing. Pronotum darker than crown, sparsely punctate with dark in male; vittae distinct. Scutellum about same color as pronotum with typical light markings present. Face greenish-fulvous in female, light green in male, slightly darkest along lateral margin of genae, long sharksmouth, vitta behind eye and another near ocellus faintly indicated. Forewing of female semihyaline fulvous with dark vermiculations throughout, very dark on apex, veins concolorous at base, darkening and becoming fuscous at apex and on costa. Forewing of female bright fulvous throughout, a few milky areoles throughout, no vermiculations; veins concolorous. Occasionally a female with one or two of the recurved veins darkened will be found.

Structural Characteristics: Crown about twice as long as width between eyes, anterior margin straight on each side of a pointed apex; wedge over one-third length of crown. Pronotum about three-fifths as long as crown, two and one-half times as wide as length at middle and four and one-half times length behind eye. Clypeus about two and one-fourth times width at ocelli, only slightly constricted at antennae. Clypellus definitely enlarged near apex. Face in lateral view almost straight. Forewing with about seven recurved veins to costa, claval veins approaching each other at cross-vein and sometimes extra cross-veins in clavus.

Genitalia: Valve about one and one-fourth times as wide as length at middle, posterior margin convex on each side of a bluntly pointed apex; anterior margin slightly concave on each side of a median lobe. Paraphysis with basal, bulb-like enlargement, almost parallel-margined to enlargement near sharp apex. Aedeagus in lateral view slightly curved, smallest near blunt apex. Styles stout, about three times as long as basal width, sinuate just before middle, lobed on dorsal margin before finger-like process on apical third.

Last ventral segment of female about twice as wide as length at middle, latero-posterior margin rounded to a small median lobe.

Types: Holotype ♂, allotype ♀ and 4 ♂ and 8 ♀ paratypes, Shuqualak, Miss., July 16, 1930, P. W. Oman, in the Snow Entomological Collections. Additional paratypes as follows: (Miss.) 2 ♂, Shuqualak, July 16, 1930, R. H. Beamer; 1 ♀, Shuqualak, July 16, 1930, L. D. Tuthill; 1 ♀, Meridian, July 17, 1930, L. D. Tuthill; 1 ♀, Hamilton, July 15, 1930, R. H. Beamer; 1 ♀, Fulton, July 14, 1930, R. H. Beamer; 1 ♂, Columbus, July 16, 1930, R. H. Beamer. (Ala.) 1 ♀, Marion Junction, July 16, 1930, R. H. Beamer. (Tex.) 2 ♂, Brownsville, Dec. 27, 1945, 2 ♀, June 29, 1938, R. H. Beamer; 1 ♀, 1 ♂, Brownsville, May 25, 1939, 1 pr., Aug. 8, 1937, D. J. and J. N. Knull; 11 ♀, 8 ♂, Brownsville, May 31, 1933, 19 ♀, 24 ♂, May 29, 1933, P. W. Oman; 2 ♀, Benchley, April 30, 1941, D. J. and J. N. Knull.

Host Plants: No host plant is known.

Comparative Notes: In some of the series, some specimens have a dis-

tinctively green head, while others are hardly green at all, but dark fulvous in the male, lighter in the female.

Scaphytopius (Cloanthanus) utahensis n. sp.

Resembles *graneticus* but larger, somewhat lighter in color, with broader aedeagus and paraphyses. Length: female 5 mm.; male 4.8 mm.

Color: Crown fulvous flecked with brown, darkest next median suture, except for light markings as follows: line along anterior margin, wedge, long arcuate line on disc on each side of median suture. Pronotum fulvous flecked with dark, vittae irregular but present. Scutellum fulvous with a few irregular brown markings on basal half and a large brown spot inside each basal corner. Face light fulvous to yellow, with fuscous-bordered light markings as follows: sharksmouth, vitta behind eye and a shorter one in front of eye near ocellus. Forewing semihyaline fulvous with veins and many vermiculations, brown.

Structural Characteristics: Crown about twice as long as width between eyes, anterior margin almost straight on each side of apex. Pronotum about two-thirds as long as crown, two and one-fourth times as wide as length at middle and three and one-half times length behind eyes. Clypeus about two and one-third times as long as width at ocelli, lateral margins slightly sinuate at antennae. Clypellus slender, only slightly enlarged near apex. Face straight in lateral view. Forewing with vein-like marks in brachial cell and about twelve recurved veins to costa.

Genitalia: Valve almost as long as greatest width, posterior margin oval, anterior margin with broad, short, truncate lobe. Paraphysis slender on basal three-fifths, gradually enlarged almost to sharp apex. Aedeagus almost parallel-margined in ventral view, long, curved near base, almost parallel-margined to blunt apex, in lateral view. Styles almost four times as long as basal width, sinuate near middle, lobed on outer margin before short, slender, finger-like apical process.

Last ventral segment of female about one and one-half times as wide as median length, latero-posterior margin rounded, slightly notched at middle.

Types: Holotype ♂, allotype ♀, and 4 ♀, and 1 ♂ paratype, Alton, Utah, Aug. 11, 1936, R. H. Beamer, in the Snow Entomological Collections.

Host Plants: The type series was collected on *Rhus* sp.

Comparative Notes: This species is tannish color and more slender than related species.

Scaphytopius (Cloanthanus) canus n. sp.

Resembles *trilineatus* but larger, lighter in color, with a light face and genital paraphyses much larger near apex. Length: female 6 mm.; male 5.6 mm.

Color: Crown light fulvous with brown irrorations, light markings as follows: line along anterior margin, wedge, irregular arcuate line on disc on each side of median suture and an indication of another line parallel to this just inside eyes. Pronotum usually slightly darker than crown, darkest on disc and sparsely sprinkled with brown dots; vittae usually evident only on lateral margins. Scutellum about same color as crown with typical mark-

ings. Clypeus, clypellus and lorae light fulvous. except for sharksmouth and irregular brown markings along base of clypeus; apex of clypellus brown. Forewings light fulvous with brown dots throughout; veins fulvous, becoming fuscous on costa.

Structural Characteristics: Crown about twice as long as width between eyes in male, slightly longer in female, anterior margin almost straight on each side of a slender, but bluntly pointed apex; wedge almost half length of crown. Eyes usually have red lines in them. Pronotum slightly over half length of crown, about two and one-fourth times as wide as length at middle and three and one-half times length behind eyes. Clypeus almost two and one-half times width at ocelli, slightly sinuate at antennae; shallow concavity along sharksmouth. Clypellus stout, slightly enlarged near apex. Face in lateral view slightly concave between anterior margin of eyes. Forewings with many vein-like marks in brachial cell, about twelve recurved veins to costa and often extra veins in clavus.

Genitalia: Valve about three-fourths as long as greatest width, posterior margin almost straight on each side of a bluntly pointed apex; anterior margin convex. Paraphysis enlarged near sharp apex. Aedeagus "J"-shaped, almost parallel margined throughout. Styles over twice as long as basal width, sinuate near middle, distinct lobe on outer margin before rather small apical process.

Last ventral segment of female about three-fourths as long as greatest width, convex and converging on lateral margins; posterior margin straight.

Types: Holotype ♂, allotype ♀, 10 ♀ and 11 ♂ paratypes, Pine Valley, Calif., July 27, 1938, R. H. Beamer, in the Snow Entomological Collections. Additional paratypes from California as follows: 1 ♀, Santa Cruz Mts., Aug. 13, 1938, R. H. Beamer; 2 ♀, Quatay, July 19, 1941, R. H. Beamer.

Host Plants: The type series was collected on *Garrya veatchii*, which is probably the host plant.

Comparative Notes: This species resembles *trilineatus*, but has a shorter crown and the face is light. The general color is much lighter than *trilineatus*. It is evidently restricted to southern California.

***Scaphytopius (Cloanthanus) trilineatus spicatus* n. subsp.**

Resembling *trilineatus* but lighter with fulvous areas of forewing restricted to apical cells and with plates sharply pointed. Length: female 5.5 mm.; male 5 mm.

Color: Crown mottled ivory and fuscous with light markings as follows: thin line along anterior margin; long wedge; irregular arcuate vitta on each side of median suture from near apex to base and usually two pairs of large dots on posterior margin, one next each eye and another on each side of median suture. Pronotum about same color as crown, lightest on anterior and lateral margins, vittae distinct. Scutellum ivory, dark irrorations and typical light markings. Face ivory with fine brown to fuscous irrorations, excepting long sharksmouth and coarser irrorations along posterior margin, darkest on lateral margins of genae. Forewing semihyaline white except for small fulvous area in apical cells, fuscous vermiculations and veins throughout.

Structural Characteristics: Crown over twice as long as width between eyes in male, twice width between eyes in female, shallow concavity on disc, anterior margin straight to slightly concave on each side of pointed apex; wedge about half length of crown. Pronotum about half as long as crown, about two and one-fourth times as wide as length at middle and four times length behind eyes. Clypeus over two and one-half times as long as width at ocelli, concavity along sharksmouth, sinuate at antennae. Clypellus enlarged near apex. Face in lateral view concave between anterior margin of eyes. Forewing with several vein-like marks in brachial cell, about twelve recurved veins to costa and sometimes extra cross-veins in clavus.

Genitalia: Valve about one and one-half times as wide as length at middle, posterior margin rounded; anterior margin with a broad, short, median lobe. Paraphysis with slight basal enlargement, slightly broadened just before sharp apex. Aedeagus in lateral view roughly "L"-shaped, short, almost parallel-margined throughout. Styles about two and one-half times as long as width at base, slightly sinuate just before middle, lobe on dorsal margin just before finger-like process on apical fifth.

Last ventral segment of female about one and one-half times as wide as length at middle, lateral margins converging; posterior margins with lobe on each side of relatively prominent median notch.

Types: Holotype ♂, allotype ♀, and 27 ♀ and 5 ♂ paratypes, Miami, Ariz., Aug. 6, 1941, R. H. Beamer, in the Snow Entomological Collections. Additional paratypes as follows: (Ariz.) 1 ♀, Miami, July 22, 1932, R. H. Beamer; 7 ♀, 8 ♂, Yarnell, July 29, 1933, 4 ♀, 1 ♂, July 27, 1933, 2 ♀, July 25, 1932, R. H. Beamer; 1 ♀, Yarnell Hts., July 2, 1929, R. H. Beamer; 1 pr., Yarnell, June 19, 1937, D. J. and J. N. Knull; 2 ♀, Yarnell Hts., June 21, 1935, 2 ♀, Oct. 8, 1929, 2 ♀, July 21, 1929, 1 ♀, Aug. 20, 1929, E. D. Ball; 9 ♀, 6 ♂, Yarnell Hts., June 29, 1933, P. W. Oman; 1 pr., Yavapai Co., July 1, 1929, 1 ♀, Aug. 9, 1927, R. H. Beamer; 1 ♂, Granite Dell, Aug. 14, 1935, R. H. Beamer; 1 ♀, Granite Dell, Oct. 6, 1929, 4 ♀, July 17, 1929, E. D. Ball; 2 ♀, Prescott, July 29, 1933, R. H. Beamer; 1 ♀, Prescott, June 30, 1939, 1 ♀, June 8, 1941, D. J. and J. N. Knull; 3 ♀, Prescott N.F., July 6, 1937, 3 ♀, July 14, 1940, 1 ♂, June 20, 1937, D. J. and J. N. Knull; 1 ♀, Santa Rita Mts., Aug. 18, 1935, R. H. Beamer; 1 ♀, Gila Co., Aug. 5, 1927, R. H. Beamer; 4 ♀, Hereford, Aug. 22, 1935, 2 prs., Huachucua Mts., July 20, 1937, D. J. and J. N. Knull; 2 ♀, Huachucua Mts., Oct. 19, 1931, E. D. Ball; 1 ♀, Oak Creek Canyon, July 13, 1940, D. J. and J. N. Knull; 1 ♀, Chiricahua Mts., Sept. 14, 1938, 1 ♀, June 15, 1939, 1 ♂, Aug. 28, 1940, D. J. and J. N. Knull; 1 ♂, Devil's Canyon, Aug. 25, 1938, D. J. and J. N. Knull; 2 ♂, Faraway Ranch, Aug. 11, 1931, E. D. Ball; 1 ♀, Glenn Oaks, July 19, 1929, 1 ♂, July 18, 1929, E. D. Ball. (N.M.) 1 ♀, Silver City, Aug. 23, 1936, R. H. Beamer.

Host Plants: The specimen from Silver City was collected on "Mountain mahogany." Ball (1932) was evidently referring to this form when he gave *Rhus trilobata* as the host plant.

Comparative Notes: The males of this subspecies can be separated from *trilineatus* by the sharp plates of the male and by the absence of the notch of the last ventral segment of the female.

NOTES ON KANSAS BUTTERFLIES

DON B. STALLINGS and J. R. TURNER

Caldwell, Kans.

During the collecting season of 1945 we made several interesting catches which we believe merit reporting:

Feniseca tarquinius Fabr. One specimen caught and a second one observed in Sumner County, Kansas, on April 29th. This species had not previously been seen in this vicinity.

Hesperia uncas Edw. Two specimens have been caught in Sumner County, Kansas, and several other specimens observed. There appear to be two broods. Our dates are August 31st, 1944, and June 6th, 1945. In Barber County, Kansas, we collected a good series of this species on May 27th, 1945, and June 17th, 1945. Other specimens were collected near Freedom, Okla., which is south and west of Barber County, on June 8th, 1945.

Hesperia viridis Edw. A good series of this species was collected in Barber County, Kansas, on May 27th and June 17th. Other specimens were collected at Freedom, Okla., on June 8th.

Hesperia attalus Edw. Several specimens were collected in Barber County and near Freedom, Okla., on the dates mentioned above.

Hesperia ottoe Edw. A single specimen was caught in Sumner County, Kansas, on June 7th, 1945. Three specimens were caught near Freedom, Okla., on June 8th. These specimens appear to be intermediate between typical *ottoe* and *ogallala* Leuss.

Amblyscirtes oslari Skin. One specimen was caught in Barber County, Kansas, on May 27th, 1945. Two specimens were caught near Freedom, Okla., June 8th. *Oslari* has not previously been recorded as occurring in Kansas.

PRICE OF BACK VOLUMES

Back Volumes \$2.50 per volume

Subscriptions for back volumes or numbers should be sent to Donald A. Wilbur, Department of Entomology, Kansas State College, Manhattan, Kansas.

CONTENTS OF THIS NUMBER

Some New North American Idiocerus (Homoptera: Cicadellidae).	
E. D. BALL and FRANK H. PARKER	73
A New Species of Delphacine Fulgorid with Notes on Four Other Species (Homoptera-Fulgoridae-Delphacinae).	
R. H. BEAMER	82
A New Subgenus and Several New Species of Scaphytopius (Homoptera-Cicadellidae).	
LEON W. HEPNER	87
Notes on Kansas Butterflies.	
DON B. STALLINGS and J. R. TURNER	110

Journal of the Kansas Entomological Society

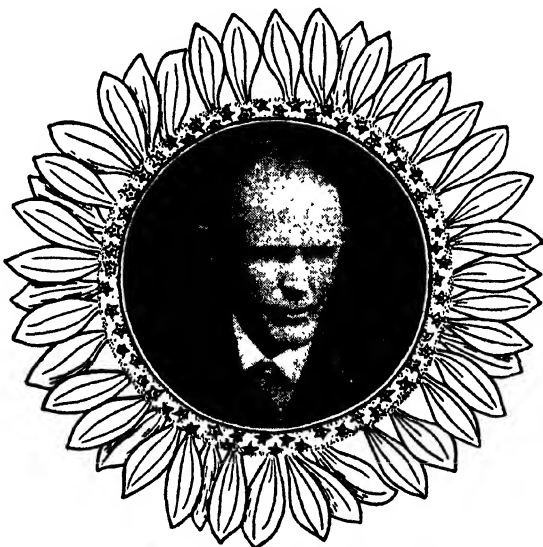
Volume 19

October, 1946

Number 4

PUBLICATION COMMITTEE

PAUL B. LAWSON, Editor, Lawrence
R. H. BEAMER, Lawrence R. H. PAINTER, Manhattan
DWIGHT ISELY, Fayetteville, Ark.



JAMES WALKER MCCULLOCH
1889-1929

Entered as second-class matter June 7, 1939 at the Post Office at
Manhattan, Kansas, under the Act of August 24, 1912.

ENTOMOLOGICAL SOCIETY JOURNAL OF THE KANSAS

A quarterly journal published in January, April, July and October devoted to Entomology in the Western Mississippi Basin and the proceedings of the Kansas Entomological Society.

Manuscripts for publication may be sent to any of the publication committee.

The Kansas Entomological Society does not make exchanges since the Society does not maintain a library.

Subscriptions to the Journal must be paid in advance. The subscription rate is so low that second notices are not ordinarily sent out.

Payment of Canadian or other foreign subscriptions and bills must be made by international Postal Money Order or by a draft on a New York bank and payable in U.S.A. dollars.

Subscribers are urged to give us their full cooperation in these matters.

Subscriptions should be sent to Donald A. Wilbur, Department of Entomology, Kansas State College, Manhattan, Kansas.

Subscriptions in the U.S.A.,	\$2.00 per year	Single Copy
Canadian or foreign subscriptions,	2.25 per year	75 cents

KANSAS ENTOMOLOGICAL SOCIETY

President, H. H. Walkden, Hutchinson, Kansas

Vice-president, Paul B. Lawson, Lawrence, Kansas

Secretary-Treasurer, Donald A. Wilbur, Manhattan, Kansas

Vol. 19, No. 4, October, 1946

This issue mailed January 7, 1947

Kansas Entomological Society

Volume 19

October, 1946

Number 4

SOME NEW SPECIES OF THE GENUS *MISTHARNOPHANTIA*, KIRKALDY (Subfamily Flatinae, Family Fulgoridae, Homoptera)

KATHLEEN C. DOERING and CHESTER F. SHEPHERD
Lawrence, Kansas

Abstract:

This paper comprises a taxonomic study of the genus *Mistharnophantia*, described by Kirkaldy in 1907. A brief history of the genus and comparative notes are given. A key to the species is included. The following six new species are described: *curta*, *ajoensis*, *extensa*, *sima*, *angusta* and *acuta*. *Rhyncopteryx caudata* Van Duzee is considered a synonym of *Mistharnophantia sonorana* Kirkaldy.

History of the Genus

Kirkaldy described the genus in 1907 with *sonorana* as the only existing species. In 1914 Van Duzee described a new genus and species which he called *Rhyncopteryx caudata*. He compared this genus to *Cyarda* but apparently was unaware of the existence of the Kirkaldy species. Comparison of two paratypes of *Rhyncopteryx*, which Mr. Ross of the California Academy of Science sent for study by the authors shows *Rhyncopteryx caudata* to be *Mistharnophantia sonorana* Kirkaldy, although the paratype of the former seems to have a slightly more bulbous head than the Nogales material of *sonorana*.

Comparative Notes on the Genus

The genus includes species of medium size, averaging approximately 6 mm. for the females, with the males somewhat smaller. Tegmina to apex of clavus slightly longer than broad, produced into an abrupt tail or cauda at apex of clavus and inflated into a conspicuous hump at about basal fourth of corium. The female is broadly angular, with cauda pointed upward. The cauda is lanceolate, extending beyond the tip of the clavus about three times its width at that point. Vertex transverse, about two or three times wider than its median length, subtruncate apically, carinate in the middle, lateral margins diverging anteriorly. Frons sloping backward and upward so that a part of the base shows from above, the disk of this basal portion sharply depressed, its apical margin sharply concave and its lateral margins expanded and slightly rolled forward. Pronotum transverse from above, its lateral portion extending collar-like around and below the eye, a sharp carina elevated somewhat ear-like posterior and mesad of eye and a conspicuous tubercle laterad of the carina. Mesonotum tricarinate.

Key to the Species

1. Cauda of corium not more than about one-sixth of total dorsal length of body, only slightly elevated.....2
 Cauda of corium one-fifth to one-fourth total length of body, elevated3
2. (1) Frons length and width equal; cauda bluntly shortened, clavus three and one-half times longer than cauda.....*curta* n. sp.
 Frons width greater than length, clavus not quite three times longer than cauda, cauda roundly pointed, from lateral view tip of frons slightly depressed.....*ajoensia* n. sp.
3. (1) Median length of frons equal to or less than median length of vertex; from below basal margin of frons truncate or nearly so4
 Frons slightly longer than median length of vertex, bulbous and rounding6
4. (3) Head shorter, extending beyond eye a distance less than or equal to length of eye; from below basal margin of frons truncate*sonorana* (Kirkaldy)
 Head longer, extending beyond eye a distance usually one-third greater than length of eye; frons from below with basal margin rounding5
5. (4) Lateral margins of vertex longer than median length of frons, anterior margin of vertex straighter than in most species; from lateral view median width of gena in front of eye is equal to more than one-half median width of frons, insect only slightly snub-nosed; from lateral view posterior half of tegmen abruptly narrowed and posteriorly elongated, with cauda more spatulate*extensa* n. sp.
 Lateral margin of vertex subequal to median length of frons, tip of head bulbous so that from side view the females especially appear snub-nosed; from a lateral view median width of gena in front of eye is equal to one-half median width of frons; tegmen not so abruptly narrowed.....*sima* n. sp.
6. (3) Median length of frons from above twice length of vertex, vertex width distinctly narrower than frontal area, a deep concavity across disk of frons and vertex; posterior half of male tegmen greatly elongated but broader with spatulate cauda, dark fuscous coloring*angusta* n. sp.
 Median length of frons long but not twice length of vertex, vertex not much narrower than frons, no pronounced concavities on disks; lower margin of tegmen acutely angled, then abruptly narrowing to a sharply pointed cauda; head pointed.....*acuta* n. sp.

Mistharnophantia sonorana Kirk. 1907

(Plates I, II, III)

Original Description

Brownish testaceous; a broad, dark fuscous stripe running from apex of head (dorsally) to hind margin of scutellum. Tegmina opaque coriaceous, pale brownish yellow, veins partly concolorous, partly dark fuscous. Length about $3\frac{7}{8}$ mm.

Hab. Arizona, Nogales; (Koebiles No. 2498). Only one specimen in bad condition, unfortunately, of this curious form; it is parasitized. It is very Issinae in appearance, but the granulation of the clavus and the structure of the head proclaim it to be Poekillopteryne. It is probably allied to *Hyphancylus*, Fowler, which that author places apparently incorrectly in the Issinae.

Comparative Notes

Size. Length of male from apex of head to tip of posterior claval suture 3.5 mm.; from tip of claval suture to tip of tegmen 1 mm.; length of tegmen 4.25 mm.; width of tegmen 2.5 mm. Female, 4 mm. from apex of head to posterior tip of claval suture; from tip of claval suture to tip of tegmen 1 mm.; length of tegmen 4.25 mm.; width 2.7 mm.

Color. Color dull yellowish or testaceous brown with veins of corium lightly mottled with dark in male, distinctly darker in female; a dorsal brown stripe extending from apex of head to tip of mesonotum and cauda deep fuscous, shaping gradually on to corium proper, cauda with a pale mark at base.

M. sonorana has a distinctly shorter head than any of the other species described in this paper. From a dorsal view the frons extends beyond the vertex a distance less than the median length of the frons and the vertex itself is shorter also in that the anterior margin of the vertex lies directly in line with the anterior margin of the eye. From a lateral view the ventral margin of the frons is so straight that it gives a distinctly flat-faced appearance with the dorsal and ventral margins of the head forming a pronounced angle. The cauda of *sonorana* is short, sharp-pointed and not elevated particularly as in other species.

Male Genitalia. The aedeagal structure is asymmetrical. The aedeagus proper is entirely hidden by the sleevelike theca. On the right side the theca bears a sclerotized hook which at base is nearly three times wider than in middle and which extends four-fifths of the thecal length, on left side is found another sclerotized hook which is little less than half of the thecal length, both hooks with sharp apices. Each harpago as viewed from a lateral view is a convex semi-circle which is one-third longer than wide at a point just anterior to dorsal hook. The hook is about two-thirds the width and bends anteriorly toward the concave side.

Female Genitalia. Tenth segment is about one and one-fourth times longer than broad, somewhat heart-shaped, the anal flap tapering to a

rounding apex. Stylus of eleventh segment conspicuous. The dorsal valves markedly reduced with their apices rather delicate and pointed. The ventral valves well developed, about one and one-half times longer than broad with a smaller spine extending about two-thirds the greater length of valve. The sheath drawn to a blunt point in middle of the dorsal margin so that at this point its width is equal to its length. There are five larger posterior teeth and five lateral teeth.

Geographical Distribution. Type locality is Nogales, Arizona. The authors have studied the specimens of this species from the following localities; a large series of about 60 males and 60 females from Nogales. Other places in Arizona are as follows: Santa Rita Mountains, 21 males and 14 females; Sasabe, 6 males and 6 females; Alter Valley, 2 males; Patagonia, 4 males and 2 females; Yarnell Mountains, 1 female and 6 males; Baboquivara Mountains, 8 females and 2 males; Littlefield, 4 males; Superior, 1 male and 1 female; San Cata Mountains, 1 male; Atoscasa Mountains, 5 females and 5 males; Tuscon Mountains, 1 female; Yavapai, 1 male and 1 female; Arivaca, 7 females; Chiricahua, 3 females; Alamo, 1 female; Congress Junction, 16 males and 13 females; Sabino Canyon, 5 males and 37 females; Tucson, 12 females, 12 males; Quinion Mountains, 2 females and 1 male; Hope, 1 male; Ruby, 1 female; Vail, 1 female; Miami, 1 male. Specimens from California are as follows: Huntington Beach, 13 females, 7 males; San Diego, 2 males; Jacumba, 3 females and 4 males; Sunset Beach, 3 females and 4 males; Gaviota, 3 males; La Jolla, 60 males and 55 females; San Monica, 3 females and 1 male; Campo, 2 males; San Onofre, 1 male and 1 female; Carlsbad, 4 males; Ventura, 1 male. Other places include Chaves Co., New Mexico, 1 female; White City, New Mexico, 1 female; Homestead, Florida, 4 males and 2 females; Hillard, Florida, 1 male; Seymour, Texas, 3 females and 5 males; Carrizo, Texas, 1 male.

***Mistharnophantia acuta* n. sp.**

(Plates I, II, III)

Size. Length of male from apex of head to posterior tip of claval suture 3.5 mm.; from tip of claval suture to tip of tegmen 1.25 mm.; length of tegmen 3.75 mm.; width of tegmen 2 mm. Female from apex of head to posterior tip of claval suture 4 mm.; from tip of claval suture to tip of tegmen 1.25 mm.; width of tegmen 2.25 mm.

Color. General body and tegmen of male testaceous. Frons light brown darkened at base, clouded with fuscous across disk, inside lateral margin near base a dark dash sometimes indicated. Clypeus dark reddish brown. Gena in front of eye marked with three small darkish dots. Apex of clavus and cauda of tegmen dark fuscous, veins lightly mottled with fuscous. Female much darker, lateral markings on frons stronger, tegmen with fuscous areas enlarged, forming a semicircular depressed spot on clavus, an interrupted brownish streak following claval suture and 2 or 3 brown cells on apex; anterior part of corium moderately clouded with dark; posterior half

more uniformly dark, except for an isolated club-shaped testaceous spot and 2 or 3 smaller round spots just anterior to cauda.

Structural Characteristics. Vertex is twice as wide as its median length, the median length being a little less than median length of dorsal part of frons. Lateral dorsal margins of frons straight, giving head from above a much narrower, pointed appearance than in any other species. The apex of frons is rolled backwards slightly, thus from a lateral view the apex of head is produced upwards. Anteriorly pronotum is roundly produced to the middle of the eye; its median length is one-half the mesonotum. Mesonotum has two lateral carinae with a slightly depressed area between; the posterior tip is drawn to a point. Front, from below, shows its greatest length equal to its greatest width; circularly rounded basally and anteriorly convex, posteriorly flattened, the sides rolled forward. The greatest length of clypeus is equal to median length of frons. From the point of greatest width the tegmen of the male narrows abruptly, while in the female the tegmen is more broadly narrowed. In both male and female the cauda is sharply constricted at tip of clavus and from there narrows to a point. The venation of tegmen is as follows: Sc₁ follows costal margin and joins Sc₂ near apex; R rather weak, apparently two branched; M rather weak, apparently two branched; Cu₁ follows claval suture, then extends to form the reticulation of the lanceolate cauda; anal veins, 1st A and 2nd A, converge near posterior tip of claval suture.

Male Genitalia. The aedeagal structure is asymmetrical. The aedeagus proper is entirely hidden by the sleeve-like theca, which in this species extends beyond the posterior end of the aedeagus. On the left side the theca bears a thickened sclerotized hook which at the base is twice as wide as in the middle and extends two-thirds of the thecal length. On the right side a shorter sclerotized hook is present which is thicker, arcuate and extends about half the thecal length. Each harpago as viewed from a flattened lateral view is a convex, semi-rectangular plate which is about twice longer than wide, and bears an apical, dorsal process or hook which is about two-thirds the length of the harpago. This hook is longer than in other species.

Comparative Notes. This species closely resembles *M. sonorana*, but both male and female are a little smaller than *sonorana*. The cauda is drawn more to a point and posterior portion of tegmen of male is more abruptly narrowed. The vertex in *M. sonorana* is three times as broad as long; in this species it is twice as broad as long. The apical margin of the frons from above and below is rounded while in *sonorana* it is truncate. The harpago has a longer hook, the sclerotized hook of the theca is more equal in size and both are thickened and the hooks are on different respective sides than in *M. sonorana*. This species resembles *sima* n. sp. From this species it is separated by the longer cauda, more flattened disk of frons and the extremely dark tegmina of females with the characteristic islands of light spots. It also resembles *M. angusta* by having a lengthened frons but the vertex is proportionally shorter in *angusta*. From all of the above species it is separated by the more pointed head.

Notes on Distribution and Location of Types. This species was described from numerous specimens taken from the following places: holotype male and allotype female, Elmendorf, Texas, July 3, 1936, M. B. Jackson. Paratypes: three males, and one female, same time and place, M. B. Jackson. Additional paratypes: twenty-six males and nineteen females, Silver City, New Mexico, July 22, 1936; seven females and three males, Elmendorf, New Mexico, July 21, 1936; four males and two females, White Sands, New Mexico, June 30, 1932; four males, Chaves Co., New Mexico, July 8, 1927; one female, Faluria, Texas, January 1, 1946; two females and three males, Las Cruces, New Mexico, August 8, 1936; two males, St. George, Utah, August 18, 1936; two males and one female, Catarina, Texas, July 6, 1938; one male, Belen, New Mexico, July 20, 1936; all collected by R. H. Beamer. In addition one male paratype, Kendell, New Mexico, July 27, 1928, L. D. Beamer, and one male paratype, Alamogordo, New Mexico, June 30, 1932, J. D. Beamer. All above types in the Snow Entomological Collections. Paratypes in the United States National Museum as follows: Eight males, Dixie, Utah, September 10, 1915, E. D. Ball; four males, Dixie, Utah, August 29, 1930, E. D. Ball; two females and one male, Tia Juana, Mexico, August 3, 1912, E. D. Ball; one male, Buckhorn, New Mexico, August 3, 1929 (no collector); three males, St. George, Utah, July 24, 1908 (no collector); one male and one female, Utah-Nevada, August 30, 1930 (no collector); one male, North Lordsburg, New Mexico, August 10, 1929 (no collector). Finally, two males and one female paratypes, Steins, New Mexico, August 8, 1932, R. H. Painter, and one female, White Sands, New Mexico, August 8, 1936, R. H. Painter, in the collection of the Kansas State College, Manhattan, Kansas.

***Mistharnophantia ajoensia* n. sp.**

(Plates I, II, III)

Size. Length from apex of head to tip of posterior claval suture 3.25 mm.; from tip of claval suture to tip of tegmen 1 mm.; width of tegmen 2.25 mm.

Color. General color of body and tegmina, yellowish brown with scattered fuscous markings. An irregular reddish brown stripe extends from tip of head to apex of mesonotum. The lateral carinae are bordered with a brown fuscous stripe. The sides of the frons and anterior portion are greenish color, the rest mottled tan. The clypeus is a reddish color. On the gena in front of the eye are three small brown dots. Tegmen tan, cauda and longitudinal veins brown, boundary of the saddle-like depression in mid clavus outlined with dark brown. The female is a little darker with an island of fuscous coloring on the tegmen and heavy marking along longitudinal veins, cells of costal border brown.

Structural Characteristics. Vertex at its greatest length is equal to median length of the dorsal part of frons and is three times as wide as its median length. Frons as viewed from below, width greater than length with its apex circularly rounded and anterior margin emarginate; viewed from above with two little depressed areas anterior to the vertex and a median

carina extending from tip of head to posterior part of vertex. Pronotum with anterior margin broadly, roundly produced and its posterior margin shallowly concave; its length through the middle approximately one-half of the length of mesonotum. Mesonotum with two slightly elevated outwardly curved carinae, the disk between them depressed slightly, also a light elevated carina anteriorly. Tegmen, as in *curta*, abbreviated, clavus not quite three times longer than cauda, cauda roundly pointed. The venation of the tegmen is as follows: Sc_1 following expanded costal margin for about one half of tegmen; Sc_2 runs across the elevation then branches to meet Sc_1 in costal margin; R runs to middle of tegmen then joins the posterior reticulated area; M runs for a short distance, then branches and along with Cu_1 and its branches makes up the venation of the thickened cauda; Cu_2 forms claval suture; 1st A follows claval suture for one-third the distance of clavus then joins 2nd A and the two extend to claval tip; 2nd A is elevated to form the hump near the commissural margin.

Comparative Notes. This species resembles *curta*, both being small species with abbreviated caudae. The cauda of corium in this species is longer than in *curta* but is shorter than in *sonorana* and other species of the genus. For further comparison see notes under the description of *curta*. The male and the female are nearly the same color and the tegmen is nearer the same shape in the two sexes than we find in other species of the genus.

Notes on Distribution and Location of the Types. The species was described from five specimens taken in the Ajo Mountains of Arizona by E. D. Ball on July 23, 1937. Holotype male, allotype female, and one paratype in the United States National Museum. One male and one female paratype retained in the Snow Entomological Collections.

***Mistharnophantia angusta* n. sp.**

(Plates I, II, III)

Size. Length of male from apex of head to tip of posterior claval suture 4 mm.; from tip of claval suture to tip of tegmen 1.2 mm.; width of tegmen 2.2 mm. Female from apex of head to tip of posterior claval suture 5 mm.; from tip of claval suture to tip of tegmen 1.3 mm.; width of tegmen 2.4 mm.

Color. General body color rusty brown with dark fuscous markings along longitudinal veins and other areas as follows: a broad fuscous stripe that runs from tip of head to tip of mesonotum, this stripe broader on mesonotum; three blackish fuscous dots on the gena in front of the eye and larger dark fuscous mark behind the eye; 2nd anal vein conspicuously dark; the posterior half of cell 1st A and all of cell 2nd A blackish brown thus making a broad dark stripe along commissural margin; cauda dark brown. Anterior part of frons is blackish, clypeus is reddish, legs are yellowish with dark markings on the tibia, and antennae are dark with tip of pedicel yellow.

Structural Characteristics. Vertex three times as wide as median length, anterior margin in line or slightly anterior to front line of eye, conspicuously depressed on disk. Dorsal part of frons with sharply depressed circu-

lar central depression; median length almost twice median length of vertex; from below frons slightly wider than long, bluntly rounded anteriorly, lateral margins forming an obtuse angle near lower part of eye, sides rolled slightly forward. Viewed from the side the dorsal margin of frons slopes ventrad at the tip which makes the tip of head angulately rounded. Pronotum two and one-half times as wide as vertex and about one-half as long as mesonotum, its anterior margins extending to middle of eye. Mesonotum with two elevated outwardly curved carinae, the disk between them flattened, lateral sides depressed, apex pointed. Tegmen rugged due to greatly elevated veins and granulose areas, a large granulose area at base of clavus and smaller area on central part of corium. The costal veins conspicuous, being heavily marked with fuscous. The costal area of the tegmina overlaps the segments of abdomen. Cauda more spatulate than in *sonorana*, less pointed apically, not suddenly constricted at tip of clavus but with posterior margin of tegmen straight, but cauda itself elevated. The venation of tegmen is as follows: Sc_1 following expanded costal margin to about half the length of tegmen; Sc_2 runs across the elevation then branches to meet Sc_1 in costal margin; R runs for short distance with Sc_2 then branches in front of elevation into two main branches; M two-branched; Cu_1 runs along claval suture, then swings down a little in the middle; Cu_2 forms the claval suture; 1st A runs for a short distance in middle of clavus, then joins 2nd A, the latter elevated, forming the hump on the clavus after which the combined veins extend to the posterior tip of claval suture; veins in cauda and along posterior margins breaking up into indistinguishable reticulation.

Male Genitalia. The aedeagal structure is asymmetrical. The aedeagus proper is entirely hidden by the sleeve-like theca which in this species is extended beyond the posterior end of the aedeagus. On the left side the theca bears a slender sclerotized hook which at base is twice wider than in middle and which extends eight-ninths of the thecal length. On right side is found another sclerotized hook which at base is three times wider than in middle and extends one-fifth of the thecal length, both hooks having sharp apices.

Comparative Notes

This species closely resembles *Mistharnophantia sonorana* Kirk. but it is much darker and slightly darker than *Mistharnophantia sima*. The frons from dorsal view is twice as wide as vertex while in *M. sonorana* the dorsal median length of frons is less or subequal to that of *angusta*. The cauda is more spatulate and not so abruptly narrowed as in *sonorana*.

Location of Types and Geographical Notes

Holotype male, and two male paratypes, Marathon, Texas, July 10, 1938, R. H. Beamer. Allotype female and five male paratypes, Ft. Stockton, Texas, July 11, 1938, R. H. Beamer. Other paratypes: one male, Marathon, Texas, July 9, 1938, R. H. Beamer; one male, same place, July 10, 1938, D. W. Craik; two males, Ft. Stockton, Texas, July 11, 1938, J. D. Beamer; four males, same place and date, D. H. Lindsay. All above types in Snow Entomological

Collections. Additional paratypes in the United States National Museum; four females and one male, Carlsbad, New Mexico, August 6, 1936, E. D. Ball.

Mistharnophantia curta n. sp.

(Plates I, II, III)

Size. Length from apex of head to posterior tip of claval suture on commissural margin 3.5 mm. From tip of claval suture to tip of tegmen .62 mm. Length of tegmen 3.25 mm.; width of tegmen 2.25 mm.

Color. General body color dirty yellowish with a greenish cast and dark brownish markings. Males darkened as follows: a broad dark brownish stripe that runs from tip of head to tip of mesonotum; brownish areas along longitudinal veins; depressed oval area in center of clavus; three black spots on gena in front of eye; frons is olive green to light brownish with the sides streaked with brownish markings. Female with above dark markings more pronounced in addition to a brown arc followed by a lighter one in center of posterior half of tegmen.

Structural Characteristics. Vertex three and a half to four times wider than median length, somewhat rectangular, its lateral margins diverging anteriorly, its median length longer than median length of frons exposed from above, slightly carinate in middle. Frons from above has a curved carina near anterior margin of head, a slight depressed area anterior to the vertex. Frons viewed from below shows its greatest length and its greatest width equal; basal margin, bluntly rounded, disk concave; from side view it extends forward not more than one and one-half times the length of the gena, therefore indicating a shorter head than in other species. Pronotum with anterior margin roundly produced and its posterior margin shallowly concave, its median length is equal to the combined length of vertex and dorsal part of frons. Mesonotum slightly more than twice as long as the pronotum with two slightly elevated outwardly curved carinae, the disk between them slightly depressed. Tegmina about one-fourth longer than head; cauda bluntly shortened, its length less than one-third of the clavus, only slightly elevated. The venation of tegmen is as follows: Sc₁ following expanded costal margin for two-thirds the length of wing then converging with Sc₂ just before caudal margin; Sc₂ branched before middle of wing; R and M branches reticulated posterior to middle of wing; Cu₁ follows along claval suture then branches; M forms the venation of the cauda; 1st A runs along the clavus then follows along together to end of claval suture.

Male Genitalia. Each harpago as viewed from a lateral view is a convex rectangular plate which is twice longer than wide at a point just anterior to dorsal hook. The hook is about two-thirds the width and extends dorsad, its apex bent again anteriorly. The aedeagal structure is asymmetrical. The aedeagus proper is entirely hidden by the sleeve-like theca. On the left side which is on the opposite side than in *sonorana* the theca bears a sclerotized hook which at base is twice wider than in the middle and which extends two-thirds the thecal length; on the right side is found another sclerotized curved hook which is about one-half the thecal length. Both have sharp apices.

lar central depression; median length almost twice median length of vertex; from below frons slightly wider than long, bluntly rounded anteriorly, lateral margins forming an obtuse angle near lower part of eye, sides rolled slightly forward. Viewed from the side the dorsal margin of frons slopes ventrad at the tip which makes the tip of head angulately rounded. Pronotum two and one-half times as wide as vertex and about one-half as long as mesonotum, its anterior margins extending to middle of eye. Mesonotum with two elevated outwardly curved carinae, the disk between them flattened, lateral sides depressed, apex pointed. Tegmen rugged due to greatly elevated veins and granulose areas, a large granulose area at base of clavus and smaller area on central part of corium. The costal veins conspicuous, being heavily marked with fuscous. The costal area of the tegmina overlaps the segments of abdomen. Cauda more spatulate than in *sonorana*, less pointed apically, not suddenly constricted at tip of clavus but with posterior margin of tegmen straight, but cauda itself elevated. The venation of tegmen is as follows: Sc₁ following expanded costal margin to about half the length of tegmen; Sc₂ runs across the elevation then branches to meet Sc₁ in costal margin; R runs for short distance with Sc₂ then branches in front of elevation into two main branches; M two-branched; Cu₁ runs along claval suture, then swings down a little in the middle; Cu₂ forms the claval suture; 1st A runs for a short distance in middle of clavus, then joins 2nd A, the latter elevated, forming the hump on the clavus after which the combined veins extend to the posterior tip of claval suture; veins in cauda and along posterior margins breaking up into indistinguishable reticulation.

Male Genitalia. The aedeagal structure is asymmetrical. The aedeagus proper is entirely hidden by the sleeve-like theca which in this species is extended beyond the posterior end of the aedeagus. On the left side the theca bears a slender sclerotized hook which at base is twice wider than in middle and which extends eight-ninths of the thecal length. On right side is found another sclerotized hook which at base is three times wider than in middle and extends one-fifth of the thecal length, both hooks having sharp apices.

Comparative Notes

This species closely resembles *Mistharnophantia sonorana* Kirk. but it is much darker and slightly darker than *Mistharnophantia sima*. The frons from dorsal view is twice as wide as vertex while in *M. sonorana* the dorsal median length of frons is less or subequal to that of *angusta*. The cauda is more spatulate and not so abruptly narrowed as in *sonorana*.

Location of Types and Geographical Notes

Holotype male, and two male paratypes, Marathon, Texas, July 10, 1938, R. H. Beamer. Allotype female and five male paratypes, Ft. Stockton, Texas, July 11, 1936, R. H. Beamer. Other paratypes: one male, Marathon, Texas, July 9, 1938, R. H. Beamer; one male, same place, July 10, 1938, D. W. Craik; two males, Ft. Stockton, Texas, July 11, 1936, J. D. Beamer; four males, same place and date, D. H. Lindsay. All above types in Snow Entomological

Collections. Additional paratypes in the United States National Museum; four females and one male, Carlsbad, New Mexico, August 6, 1936, E. D. Ball.

***Mistharnophantia curta* n. sp.**

(Plates I, II, III)

Size. Length from apex of head to posterior tip of claval suture on commissural margin 3.5 mm. From tip of claval suture to tip of tegmen .62 mm. Length of tegmen 3.25 mm.; width of tegmen 2.25 mm.

Color. General body color dirty yellowish with a greenish cast and dark brownish markings. Males darkened as follows: a broad dark brownish stripe that runs from tip of head to tip of mesonotum; brownish areas along longitudinal veins; depressed oval area in center of clavus; three black spots on gena in front of eye; frons is olive green to light brownish with the sides streaked with brownish markings. Female with above dark markings more pronounced in addition to a brown arc followed by a lighter one in center of posterior half of tegmen.

Structural Characteristics. Vertex three and a half to four times wider than median length, somewhat rectangular, its lateral margins diverging anteriorly, its median length longer than median length of frons exposed from above, slightly carinate in middle. Frons from above has a curved carina near anterior margin of head, a slight depressed area anterior to the vertex. Frons viewed from below shows its greatest length and its greatest width equal; basal margin, bluntly rounded, disk concave; from side view it extends forward not more than one and one-half times the length of the gena, therefore indicating a shorter head than in other species. Pronotum with anterior margin roundingly produced and its posterior margin shallowly concave, its median length is equal to the combined length of vertex and dorsal part of frons. Mesonotum slightly more than twice as long as the pronotum with two slightly elevated outwardly curved carinae, the disk between them slightly depressed. Tegmina about one-fourth longer than head; cauda bluntly shortened, its length less than one-third of the clavus, only slightly elevated. The venation of tegmen is as follows: Sc₁ following expanded costal margin for two-thirds the length of wing then converging with Sc₂ just before caudal margin; Sc₂ branched before middle of wing; R and M branches reticulated posterior to middle of wing; Cu₁ follows along claval suture then branches; M forms the venation of the cauda; 1st A runs along the clavus then follows along together to end of claval suture.

Male Genitalia. Each harpago as viewed from a lateral view is a convex rectangular plate which is twice longer than wide at a point just anterior to dorsal hook. The hook is about two-thirds the width and extends dorsad, its apex bent again anteriorly. The aedeagal structure is asymmetrical. The aedeagus proper is entirely hidden by the sleeve-like theca. On the left side which is on the opposite side than in *sonorana* the theca bears a sclerotized hook which at base is twice wider than in the middle and which extends two-thirds the thecal length; on the right side is found another sclerotized curved hook which is about one-half the thecal length. Both have sharp apices.

Comparative Notes

This species closely resembles *M. ajoensia* having the cauda shortened, its length not more than one-sixth total dorsal length of body and only slightly elevated. The two species can be separated as follows: the median length of vertex is greater than the dorsal part of frons in *curta*; in *M. ajoensia* the vertex is less than the median dorsal length of frons; the apex of frons in *curta* is bluntly produced, in *ajoensia* roundly produced. In *ajoensia* median length of frons is less than its greatest width, while in *curta* the greatest length and width are equal. The venation of the tegmen is similar with the anterior branches forming reticulation which makes it impossible to trace their branching.

Notes on Distribution and Location of Types. This species was described from six specimens collected at Kino Bay, Mexico by E. D. Ball, Dec. 9 (year not recorded). Holotype male, allotype female, one paratype male and one paratype female in the United States National Museum. One paratype male and one paratype female retained in the Snow Entomological Collections.

Mistharnophantia extensa n. sp.

(Plates I, II, III)

Size. Length from apex of head to posterior tip of claval suture 4.25 mm.; from tip of claval suture to tip of tegmen 1.25 mm.; length of tegmen 3.5 mm.; width of tegmen 2.75 mm.

Color. General color of body and tegmen of male uniformly testaceous only the cauda dark brown. Female darker, clouded with fuscous as follows: a broad brown stripe on mesonotum faintly indicated, base of frons and the usual depressed oval area in center of clavus reddish brown, a large irregular marking in the form of the letter C with curved side next the claval suture and about eight or nine round light brown spots between the C and costal margin, cauda blackish brown with thick veins reddish brown.

Structural Details. Anterior margin of vertex straight, its median length subequal to median length of frons; its lateral margin is distinctly longer, almost one-third greater than median length of frons so that vertex, on first glancing at head, is a conspicuous rectangle; the anterior margin of vertex is slightly concave, a median carina is distinctly present and the lateral margins diverge anteriorly. From above disk of frons depressed; from below its greatest length is equal to its greatest width, the basal margin sharply rounded and anterior margin concave. Pronotum with median length about twice length of frons, roundly produced anteriorly to the middle of the eye, a slight median carina present. Mesonotum is equal to the combined length of head and pronotum; it has two laterally curved carinae with depressed area between; and the tip is pointed. Tegmina elongate, posterior half of male tegmen abruptly narrowed, but cauda itself spatulate, not constricted abruptly at apex of clavus, elevated about one-fourth of the total dorsal length.

The venation of tegmen is as follows: Sc₁ following expanded costal margin to about half the length of tegmen; Sc₂ runs across the elevation then branches to meet Sc₁ in costal margin; R is apparently two-branched; M two-branched with its outer branches extending to the tip of tegmen; Cu₁ runs close to claval suture then branches in the tip of tegmen; Cu₂ forms claval suture; 1st A runs along middle of clavus and 2nd A near commissural margin, meeting toward the posterior portion of claval suture.

Male Genitalia. Each harpago as viewed from a flattened lateral view is a convex semicircle which is about one-third longer than wide at a point just anterior to dorsal hook. The hook is about one-half the width and bends anteriorly and dorsad. The aedeagal structure is asymmetrical with the thecal hooks in the same respective position as in *sonorana*. The aedeagus proper is entirely hidden by the sleeve-like theca which in this species has a conspicuous overlapping posterior lobe protruding over the base of the thecal hook. On the right side the theca bears a slender sclerotized hook, which extends about two-thirds the thecal length. In other species except *sonorana* this long hook is on the left side. On the left side is found another sclerotized hook which is shorter and heavier at the base where it then forms an acute angle in the middle which is half membranous and half sclerotized, giving it a more slender appearance than in other species, after which it bulges slightly, finally tapering to a sharp apex. This short hook in other species except *sonorana* is on the right side.

Comparative Notes

This is a distinctive species in color and general shape of tegmen. The male specimens are testaceous, thus superficially resembling *sonorana* and *acuta* but are distinguished by the contrasting brown cauda. The female is distinguished by the inverted "C" marking on posterior half of corium. Structurally the species seems closer to *angusta* since both have the straight posterior margin of tegmen with spatulate cauda. The two are separated by the fact that the cauda of *extensa* is more spatulate while in *angusta* it is more lanceolate; the length of head and pronotum is equal to length of mesonotum in *extensa*, while in *angusta* the mesonotum is larger; the dorsal median length of frons in *angusta* is much longer to median length of vertex and the general color of *angusta* is dark fuscous while in *extensa* a general light tone is characteristic except for contrasting brown markings as described above.

Notes on Distribution and Location of Types. This species was described from numerous specimens taken at the following places: holotype male, Arizona, C. F. Baker; allotype female and three female paratypes, Yuma, Arizona, August 25, 1929, E. D. Ball; one male and one paratype female, Kino Bay, Mexico, December 8, E. D. Ball; two females, Comstock, Texas, August 9, 1936, E. D. Ball. All above types are in the United States National Museum.

Other paratypes in the Snow Entomological Collections are: two females and two males, Ugnacio, Texas, August 5, 1938; two females and four males,

Alamo, Arizona, August 14, 1935; one female and two males, Tularosa, New Mexico, July 1, 1940; two females and one male, Malaga, New Mexico, August 11, 1936; one male, Arivaca, Arizona, July 25, 1933; two females, Nogales, Arizona, July 25, 1933; all collected by R. H. Beamer. Other paratypes are: four females, Cochise, Arizona, August 24, 1935, Jean Russell, and one female, Brewster Co., Texas, June 17, 1908, Mitchell Cushman.

***Mistharnophantia sima* n. sp.**

(Plates I, II, III)

Size. Length of female from apex of head to tip of posterior claval suture on commissural margin 4.5 mm.; from the tip of claval suture to tip of tegmen 1.5 mm.; length of tegmen 5 mm.; width of tegmen 2.8 mm. Male from apex of head to tip of posterior claval suture 4 mm.; from the tip of claval suture to tip of tegmen 1.2 mm.; width of tegmen 2.5 mm.

Color. General color of body and tegmina brown with an olive green caste in spots, an irregular reddish brown stripe extends from a point just inside tip of head to apex of mesonotum, rest of head and thorax mottled. Postclypeus reddish brown across basal half becoming greenish across apex, anteclypeus tawny. Genae greenish. Tegmina tannish brown with vein 2nd A and apical branches of other longitudinal veins dark blackish brown, cauda darker brown than rest of tegmen and a conspicuous depressed brown area midway of clavus, this area outlined by a curved black-marking starting midway of 2nd A vein. 1st A curving posteriorly to the point of joining of veins 1st A and 2nd A, the lower part of the depression viewed from dorsal side blackish brown, the combined depressed areas of the two wings giving the appearance of having been pinched by the thumb and finger of the hand. Female darker and more heavily marked with fuscous than the male. Legs uniform yellowish tan.

Structural Characteristics. Vertex semi-rectangular, its lateral margins diverging anteriorly, its median length approximately equal to median length of frons exposed from above and its lateral margin subequal to median length of frons, slightly carinate in middle. Frons with anterior portion bulbous, posterior part sharply concave, sides expanded and slightly rolled forward, greatest length and greatest width subequal, as viewed from the side frons extends forward twice the length of gena in front of the eye, the females particularly having a snub-nosed appearance, the gena itself extended in front of eye a distance one-half length of eye. Median length of clypeus equal to median length of frons on ventral side. Eyes snugly adjoining lateral corner of pronotum, their width a little less than half width of vertex. Pronotum with anterior margin somewhat squarely roundly produced and its posterior margin shallowly concave, its length through middle approximately one-half of the length of mesonotum. Mesonotum with two slightly elevated outwardly curved carinae, the disk between them depressed posteriorly.

The anterior portion of tegmina with 2nd A vein elevated starting in line with apex of mesonotum. Tegmen of female boat-shaped, with the anal area

tip pointed backward and the entire apical margin angulately concave. The male costal margin is more rounded than in the female, and the lanceolate cauda in the male is pointed upward making almost a direct line from tip of tegmen to the broad part of tegmen which gives a characteristic appearance of resembling an English sparrow. Vein Sc_1 elevated into a conspicuous hump at a point in line with apex of mesonotum.

The venation of tegmen is as follows: Sc_1 following expanded costal margin almost entire length of tegmen; Sc_2 runs across the elevation then branches to meet Sc_1 at the broadest portion of wing; R is apparently two-branched; M two-branched; Cu_1 runs adjacent to claval suture; Cu_2 forms the claval suture; 1st A runs along middle of clavus and 2nd A near commissural margin, meeting in the center of the clavus then running together to the end of claval suture. Each tegmen has a pimple-like area under the hump on commissural margin, also three smaller areas, one on side of subcostal elevation, one posterior to the depressed area on commissural margin, and one below R_{2+3} .

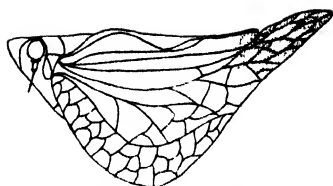
Male Genitalia. Each harpago viewed from flattened lateral view is a convex semicircular plate which is four times longer than wide at a point just anterior to dorsal hook. The hook is about two-thirds the width and bends anteriorly and toward concave side. The aedeagal structure is asymmetrical. The aedeagus proper is entirely hidden by the sleeve-like theca which in this species has a conspicuous overlapping posterior lobe protruding over base of the thecal hook. On the left side the theca bears a sclerotized hook which at base is three times wider than in middle and which in length is three-fourths of the thecal length. On the right side is found another sclerotized, posteriorly directed hook which is about one-half the length of the right hook. Both hooks with sharp apices.

Comparative Notes

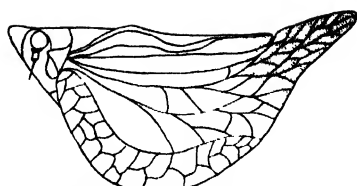
This species closely resembles *M. sonorana*. It is distinguished by its darker coloring, more bulbous, snub-nosed frons and elevated cauda.

Notes on Distribution and Location of Types. This species was described from numerous specimens. Holotype, male, allotype female and five male and six female paratypes, Laredo, Texas, June 3, 1933, P. W. Oman. Other paratypes: four males and three females, Castle Springs, Arizona, August 4, 1941, R. H. Beamer; three females from Mt. Spring, California, July 25, 1938, R. H. Beamer; four females, Catarina, Texas, June 3, 1933, P. W. Oman; two males, Alamo, Arizona, August 14, 1935, Jean Russell; one male, Talfuria, Texas, January 1, 1946, R. H. Beamer; three females, Bradshaw Mts., Arizona, August 27, 1935, E. D. Ball; one male and two females, N. Laredo, Mexico, August 31, 1936, E. D. Ball; one male, Leeds, Utah, August 9, 1936, R. H. Beamer.

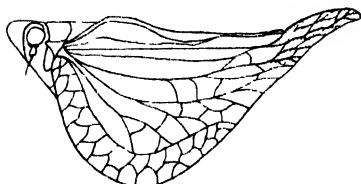
Types and some paratypes in the United States National Museum; other paratypes in the Snow Entomological Collections.



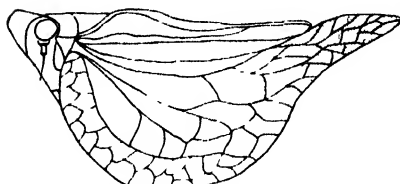
1 *Mitharnophantia sonora*



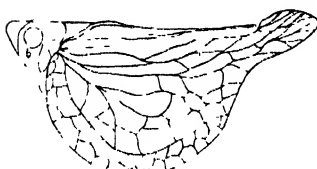
2 *Mitharnophantia sonora*



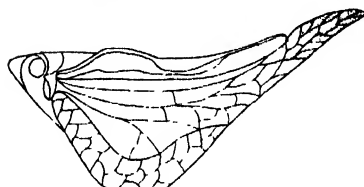
3 *Mitharnophantia sima*



4 *Mitharnophantia sima*



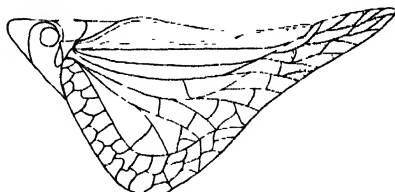
5 *Mitharnophantia ajoensis*



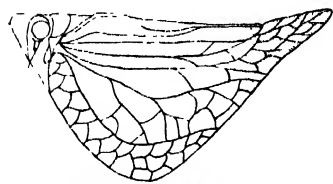
6 *Mitharnophantia ajoensis*



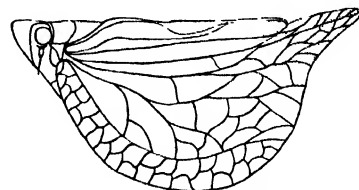
7 *Mitharnophantia curta*



8 *Mitharnophantia curta*



9 *Mitharnophantia acuta*



10 *Mitharnophantia acuta*

Plate I
(Plates I, II, III)

- 1 Lateral view of male of *Mitharnophantia sonora* Kirk.
- 2 Lateral view of female of *Mitharnophantia sonora* Kirk.
- 3 Lateral view of male of *Mitharnophantia sima* n. sp.
- 4 Lateral view of female of *Mitharnophantia sima* n. sp.
- 5 Lateral view of male of *Mitharnophantia ajoensis* n. sp.
- 6 Lateral view of female of *Mitharnophantia ajoensis* n. sp.
- 7 Lateral view of male of *Mitharnophantia curta* n. sp.
- 8 Lateral view of female of *Mitharnophantia curta* n. sp.
- 9 Lateral view of male of *Mitharnophantia acuta* n. sp.
- 10 Lateral view of female of *Mitharnophantia acuta* n. sp.

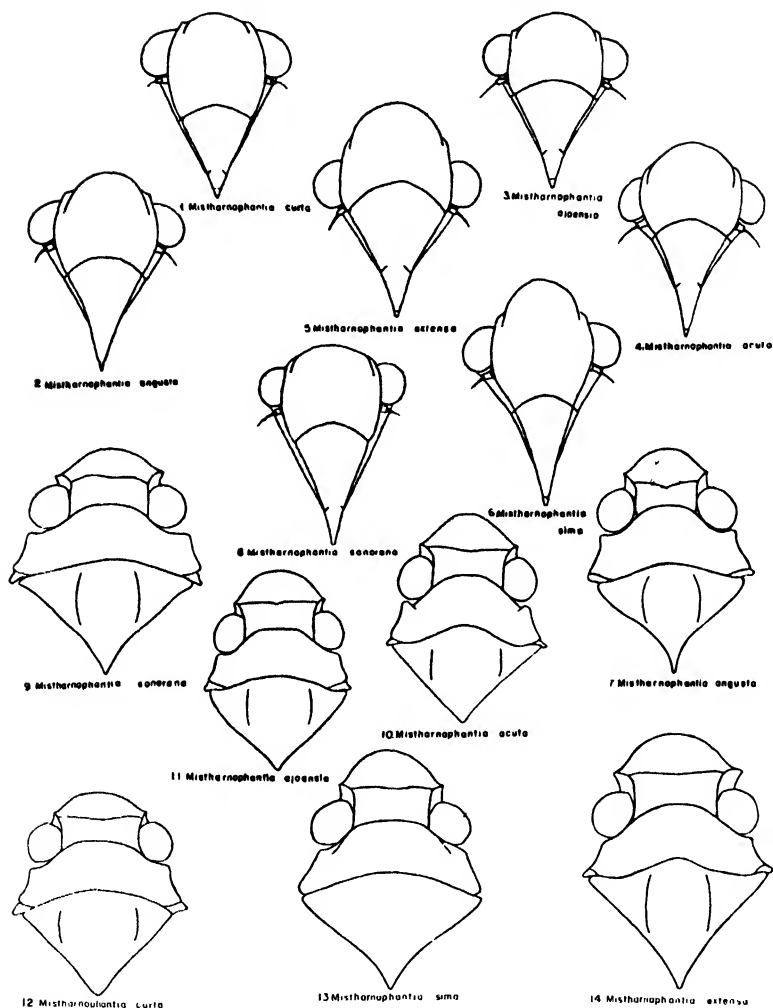


Plate II

- 1 Cephalo-ventral aspect of head of *Mistharnophantia curta* n sp
- 2 Cephalo-ventral aspect of head of *Mistharnophantia angusta* n sp
- 3 Cephalo-ventral aspect of head of *Mistharnophantia ajoensis* n sp.
- 4 Cephalo-ventral aspect of head of *Mistharnophantia acuta* n sp
- 5 Cephalo-ventral aspect of head of *Mistharnophantia extensa* n sp.
- 6 Cephalo-ventral aspect of head of *Mistharnophantia sima* n sp.
- 7 Dorsal view of head and thorax of *Mistharnophantia angusta* n sp
- 8 Cephalo-ventral aspect of head of *Mistharnophantia sonora* Kirk
- 9 Dorsal view of head and thorax of *Mistharnophantia sonora* Kirk
- 10 Dorsal view of head and thorax of *Mistharnophantia acuta* n sp
- 11 Dorsal view of head and thorax of *Mistharnophantia ajoensis* n sp
- 12 Dorsal view of head and thorax of *Mistharnophantia curta* n sp.
- 13 Dorsal view of head and thorax of *Mistharnophantia sima* n sp
- 14 Dorsal view of head and thorax of *Mistharnophantia* n sp

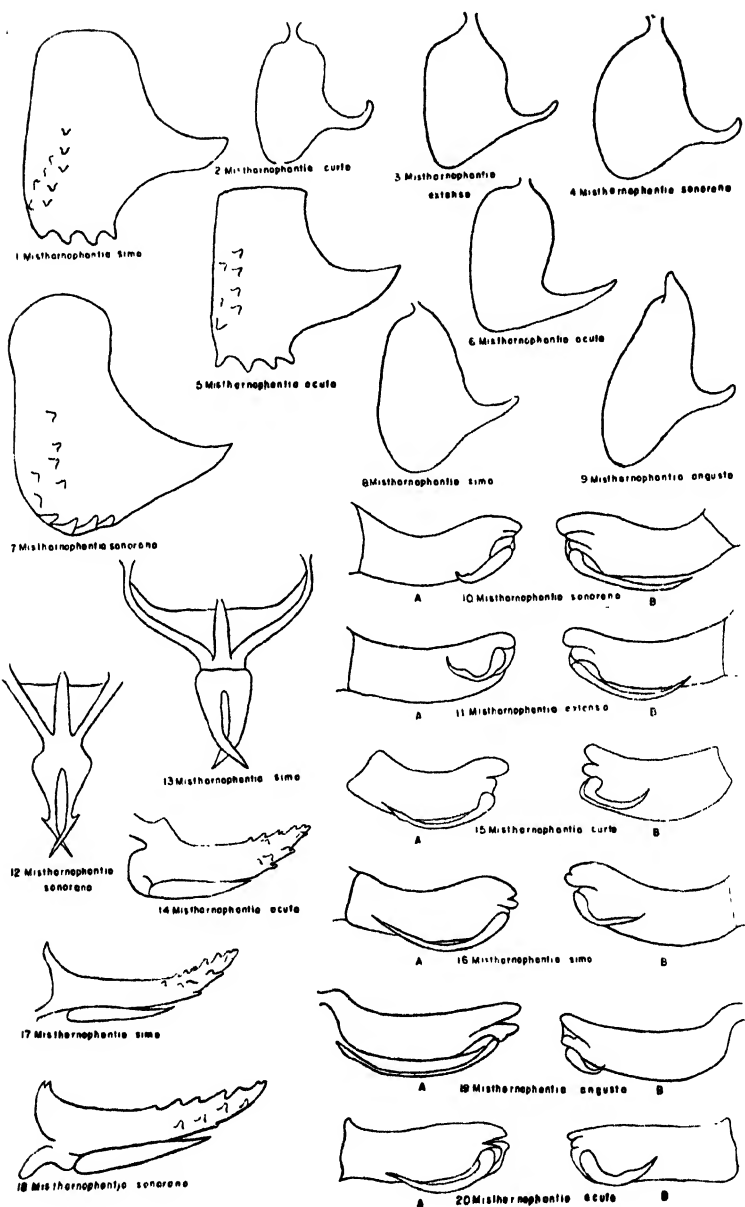


Plate III

1. Lateral valve of ovipositor of *Mistharnophantia sima* n. sp.
- 2 Lateral aspect of harpago *Mistharnophantia curta* n. sp.
3. Lateral aspect of harpago *Mistharnophantia extensa* n. sp.
- 4 Lateral aspect of harpago *Mistharnophantia sonorana* Kirk
5. Lateral valve of ovipositor of *Mistharnophantia acuta* n. sp.
6. Lateral aspect of harpago of *Mistharnophantia acuta* n. sp.
7. Lateral valve of ovipositor of *Mistharnophantia sonorana* Kirk
8. Lateral aspect of harpago of *Mistharnophantia sima* n. sp.
9. Lateral aspect of harpago of *Mistharnophantia angusta* n. sp.
10. (A) Lateral left view of aedeagus and theca of *Mistharnophantia sonorana* Kirk
(B) Lateral right view of aedeagus and theca of *Mistharnophantia sonorana* Kirk
11. Lateral left view of aedeagus and theca of *Mistharnophantia extensa* n. sp.
12. Rudimentary anterior valve of *Mistharnophantia sonorana* Kirk
13. Rudimentary anterior valve of *Mistharnophantia sima* n. sp.
- 14 Lateral aspect of ovipositor of *Mistharnophantia acuta* n. sp.
15. (A) Lateral left view of aedeagus and theca of *Mistharnophantia curta* n. sp.
(B) Lateral right view of aedeagus and theca of *Mistharnophantia curta* n. sp.
- 16 (A) Lateral left view of aedeagus and theca of *Mistharnophantia sima* n. sp.
(B) Lateral right view of aedeagus and theca of *Mistharnophantia sima* n. sp.
17. Lateral aspect of ovipositor of *Mistharnophantia sima* n. sp.
18. Lateral aspect of ovipositor of *Mistharnophantia sonorana* Kirk
19. (A) Lateral left view of aedeagus and theca of *Mistharnophantia angusta* n. sp.
(B) Lateral right view of aedeagus and theca of *Mistharnophantia angusta* n. sp.
- 20 (A) Lateral left view of aedeagus and theca of *Mistharnophantia acuta* n. sp.
(B) Lateral right view of aedeagus and theca of *Mistharnophantia acuta* n. sp.

I'LL TELL YOU HOW

LUCY BEAMER
Lawrence, Kansas

I go collecting with my husband. Not that I ever catch anything of importance. I'm sure I don't know why he takes me with him summer after summer but the way he says, "We took a new species," when he's telling about it afterwards makes me ready to go again and again and not ask too many questions. You understand, of course, that the "we" is rhetorical. I have collected with him for fifteen summers—collected *beside him*, in front of him, *behind him*, *timing the sweep of my net to match his*, trying to roll my net just as he does, moving slowly and evenly close to the ground, or swiftly and forcefully as the case may be. I've draped my net over a battered hat and looked for insects on the bolting cloth screen in the top of it,

I've mumbled indistinctly around an aspirator as I sucked in small particles of life, and peered knowingly to right and left to locate insects on the wing. In fact I've done everything, except catch the good ones. So knowing all about it except how to do it, I shall try to answer a question he is sometimes asked flatteringly, "How do you do it?" With this apology for speaking I should like to record a few of the tricks we have learned from friends and from chance circumstances which have added to our pleasure and success in collecting some of the rare insects we have taken in recent months.

On a collecting trip at Piney Point, Md., Dr. R. I. Sailer walked backward in a shallow, sedge-filled pool of brackish water seiving the water as it welled up through and over the trampled vegetation. When we heard him exclaim over a rare Myrid—so rare in fact that it was new to the National Museum Collection, we began imitating his method. We were rewarded not only with more of this Myrid but with Hydrometrids, Hebrids, Delphacids, and Celaphids—twenty Celaphids in one net full. This method has since proven its worth in several other habitats where vegetation is growing in water.

Methods of collecting grow step by step, a suggestion here, a chance bit of luck months later. We had collected *Dorycephalus* with the late Dr. E. D. Ball by lying flat on the ground, parting the stems of the grasses and taking the slender little alligators with our aspirators. Varying the method to suit the occasion we found one summer that we could take Ochterids beside permanent streams of hot water almost whenever we wished to expend the energy to get close enough to the moist not earth to see the tiny beasts with our bifocals. This summer we found the method sometimes worked with Delphacids and other difficult insects in a great variety of habitats. It is guaranteed to produce the maximum of discomfort to the collector in the shortest length of time. He can become completely covered with chiggers, he can approach a heat stroke, he can make elbows and knees sore for a week, and when the ground is seepy with water his clothes soon lose all resemblance to what the well dressed gentleman should wear. But when all other methods fail, it is worth trying.

It was only a natural step from the afore-described procedures to the knowledge that some insects which live deep in bunches of grass, or actually down in the roots, can be taken by cutting the bunches with a knife and either taking the insects directly from the stubble or shaking them onto a net from the cut portion. In so doing we have often dulled the cook's butcher knife and have worn down whetstones sharpening it afterward.

Finding great rank sedges in a patch in Meade County, Kansas, yielding nothing, we started in desperation to trample them down and then sweep over the trampled patches. Immediately we began getting an occasional specimen of *Dorydiella kansana*, a species of Cicadellid then undescribed and in a few minutes we took one specimen of a tiny new Fulgorid *Bakerella rotundifrons* Beamer. Some time later we returned to this spot to find the farmer had mowed through the edge of this patch of sedges and by sweeping the stubble we were able to take many specimens of this new

species, and also another new species in the same genus, **Bakerella bidens** Beamer. Shortly after this experience we took an occasional long winged specimen of **B. cinerea** in a patch of sedges growing near Lawrence at the rate of only one for a half hour's work. Examining the sedges by hand we found both long and short winged forms of this species living in the four-inch mat of dead stems thru which the green sedges were growing. So quick were these Delphacids when they were exposed that the utmost speed was necessary to get them in an aspirator. This vigorous method even when successful damaged the soft bodies and ruffled the frail wings. We came home and got a small garden sickle with which we mowed a swath about two by eight feet. In this bare stubble we could take as many as a dozen specimens at one sweeping. Later in the summer we chanced upon a wild grass meadow the day the farmer was mowing it. We had been taking a few specimens of some of the well known Delphacids in this meadow but now sweeping over the freshly raked stubble we found hundreds of specimens not only of the common kinds but also of several new species which we had not seen at all before. In the uncut grass nearby we could rarely take one. Returning after a few days of hot sun on the meadow we could get very few specimens on the cut portion. Apparently there was virtue in the grass being freshly cut. This series of experiences led to our taking a scythe on our collecting trips as part of our regular equipment. Sometimes the results are amazing. We can't always predict when cutting will increase the catch. Sometimes it yields nothing but strenuous exercise. But many times when we find too little of interest in a likely spot, mowing a patch eight or ten feet square brings a rich reward.

Arriving one morning at a new patch of sedges we had high hopes for a new Delphacid. The sedges were heavy, thick, as tall as our heads, and growing in shallow water. The most vigorous sweeping brought nothing. Then we placed a sweeping bag just above the water level, tight against a bunch of sedges. Approaching the clump on the side opposite the net we hit it a sharp whack with the side of the hand. On the very first attempt there were a number of specimens of a new **Kelesia**. We had even better results when we changed to a water net. The bag of the water net was much shallower and the one straight edge of the net fitted up against the bunches closer. We also used variations of this method many times to collect numerous interesting specimens while the vegetation was too wet from rain or dew for ordinary methods.

Each student we have taken with us and certainly every specialist we have had the pleasure of meeting in the field has added his bit to the cumulative whole. We like best of all to go collecting with specialists, for each man has his own little tricks and the more ways we learn the better the chase. Now if someone will kindly suggest a way to have hip boots, knee pads, a waterproof shield to sit or lie on, and Father Time's scythe in addition to normal collecting equipment without being encumbered with the paraphernalia, we'll apply for priorities on a human dynamo to keep them all going without getting tired.

A NEW GENUS OF NEARCTIC STAPHYLINIDAE (Coleoptera)

MILTON W. SANDERSON

Illinois Natural History Survey, Urbana, Illinois

The curious genus to be described was taken in leaf mould and decayed vegetation in deep rock crevices in Devil's Den State Park a few miles west of Winslow, Arkansas. In one area of the park there are many such crevices, some of which are fifty feet in depth.

This genus does not appear to belong to any North American subfamily of **Staphylinidae**, defined at present, but shows some affinities to several groups, notably the **Phloeocharinae**, **Trichophyinae**, **Habrocerinae**, and **Tachyporinae**.

In Blackwelder's (1943) key to the subfamilies occurring in the West Indies, this genus would appear to be associated with the **Oxytelinae** chiefly on the basis of the presence of the second abdominal sternite. However, the second sternite in the **Oxytelinae** is a complete and well defined sclerite, as described by Blackwelder, and not mesally divided and strap-like as in this genus. In the keys to subfamilies by Handlirsch (1924) and Hatch (1927), it would be placed with the **Paederinae**. The intersegmental membrane of the abdomen is without a pattern as described for that subfamily by Blackwelder (1943), and the antennae are situated nearer the eyes in this genus.

Excluding the **Oxytelinae** and **Paederinae** from further consideration, the present genus shows some relationship to the **Tachyporinae**, **Trichophyinae**, and **Habrocerinae** if one arbitrarily considers the hind coxae as triangular or transverse rather than more nearly conical. The sexual modifications of both sexes of this genus are reminiscent of certain tachyporines, notably **Tachinus**. However, the head in these subfamilies is much more inclined and inserted in the thorax to the eyes. It appears to show even more affinities with **Olisthaerus** Heer in the **Phloeocharinae** since the head in that genus is directed forward and the eyes are not adjacent to the thorax. Although it is not believed that this genus necessarily belongs in the same subfamily with **Olisthaerus**, it is provisionally placed there but as a distinct genus. The following key will distinguish the two genera:

Gular sutures parallel; outer antennal segments transverse; 7th and 8th sternites of male not strongly modified; male genitalia with distinct lateral lobes; front margin of 7th sternite not produced at middle under posterior margin of 6th sternite. **Olisthaerus** Heer

Gular sutures strongly divergent behind middle; all antennal segments longer than wide; 7th and 8th sternites of male strongly modified; male genitalia without lateral lobes; front margin of 7th sternite produced at middle below posterior margin of 6th sternite **Rimulincola** n. gen.

Rimulincola new genus

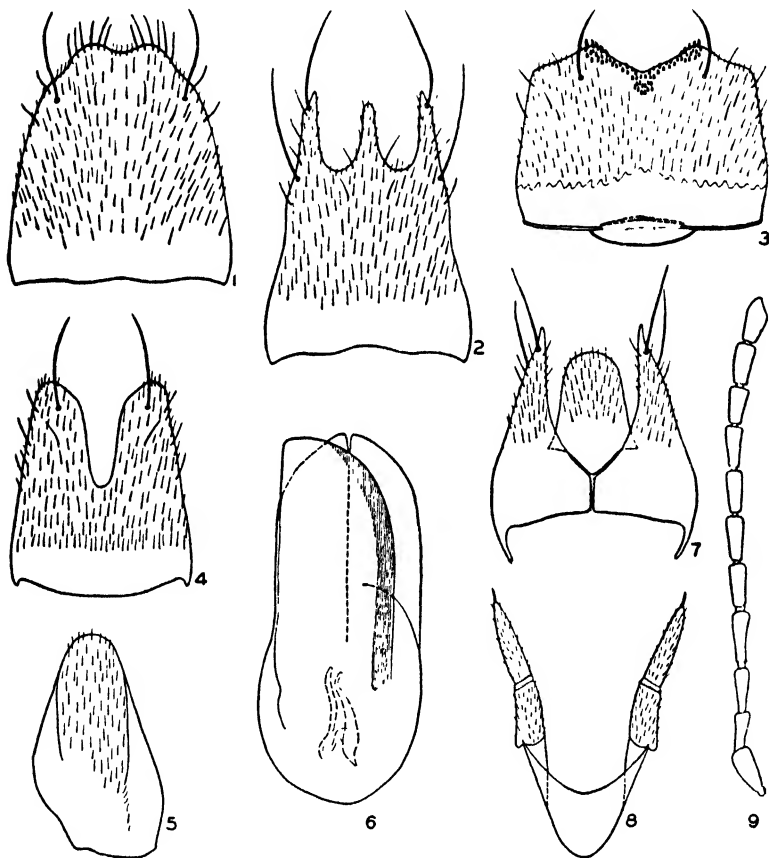
Antennae slender, 11-segmented, uniformly covered with setae, and inserted at the sides of the front very close to the eyes. Ocelli absent. Labrum subtruncate, outer angles distinct. Mandibles without teeth. Maxillary palpus 4-segmented, labial palpus 3-segmented. Gular sutures converging to about the middle then rapidly diverging to base of head. Head horizontal, without distinct neck, and set into prothorax for one-fourth its length. Front coxae prominent, conical and contiguous; prosternum slightly produced between them; coxal cavities open behind. Middle coxae conical, narrowly separated. Posterior coxae conical, contiguous at extreme base and reaching the metasternal episternum and epimeron; inside of coxa convex, the outer side angularly produced near the trochanter. Tarsus 5-segmented. Legs slender; tibia with a fringe of short irregular spinules on the outer side and two larger spines inside; tarsal claws very small. Elytra well developed. Hind wings developed but extending only to apex of fourth abdominal segment; elytral epipleura prominent and nearly vertical. Abdomen with conspicuous paratergites on first four visible segments. Second abdominal sternite present, consisting of a narrow strap-like plate divided on meson and lying in the inter segmental membrane. Intersegmental membrane apparently devoid of pattern. Front margin of 7th sternite produced at middle below posterior margin of 6th sternite. Posterior margins of 7th and 8th sternites of male, and 8th tergite of female with sexual modifications.

Genotype: **Rimulincola divalis** n. sp.

Rimulincola divalis n. sp.

Male.—Length 4.5 mm., width 1.22 mm. Body elongate, nearly uniformly brown and shining, clothed with conspicuous golden hairs, and resembling the genus *Geodromicus* in the *Omaliinae* in general appearance. Head narrower than pronotum, slightly broader behind the eyes where the sides are rounded and sinuate before the base; base of head truncate; upper surface closely, umbilicately punctured and slightly but broadly depressed in the labro-clypeal region and on either side of the middle between the eyes; under surface of head less distinctly punctured. Antenna (fig. 9) lighter than body, filiform, very long, extending nearly to elytral apex; segments 2 to 3 times longer than wide and uniformly widened to their apices; segments nearly uniformly covered with golden hairs which become much shorter beyond basal two or three segments. Pronotum about $1\frac{1}{4}$ times broader than long, shorter and narrower than elytra, evenly rounded in anterior half then distinctly narrowed and sinuate before base; width before middle about $\frac{1}{3}$ greater than at base; pronotum less closely punctured than head, with slight transverse depression at base, a median longitudinal one, and an anterior depression toward the front on each side of middle. Elytra $\frac{1}{2}$ longer than pronotum, slightly longer than wide, closely though somewhat irregularly punctured. Abdomen finely though somewhat rugosely punctured above, more coarsely punctured below, the punctures larger toward anterior margins of segments; posterior margin of 7th sternite (fig. 3)

emarginate at middle and with a dense group of short nearly black spines along the emargination and extending a little anteriorly at middle; 8th sternite (fig. 4) deeply and narrowly emarginate; last sternite slightly asymmetrical (fig. 5); penultimate tergite divided on meson (fig. 7). Male genitalia (fig. 6) rather simple with a dorsal asymmetrical piece, lower pieces symmetrical, parallel, narrowly emarginate at the narrowed apex; internal structures on copulatory sac asymmetrical.



Explanation of Plate

- Fig 1 Eighth sternite of female
 Fig 2 Eighth tergite of female.
 Fig 3 Seventh sternite of male
 Fig 4 Eighth sternite of male
 Fig 5 Last sternite of male
 Fig 6 Male genitalia
 Fig 7 Last two visible tergites of male.
 Fig 8 Female genitalia.
 Fig 9 Antenna of male

Female.—Similar to male except for sexual differences. Eighth sternite (fig. 1) narrowed at apex, slightly bilobed, the lobes fringed with a few long setae; 8th tergite produced posteriorly into three long pointed lobes (fig. 2), each slightly more than $\frac{1}{2}$ length of segment, the middle one a little shorter than outer ones; apex of each outer lobe with a long black seta; two halves of penultimate tergite completely separated at base by last visible tergite; female genitalia as illustrated in fig. 8, the coxites long, two segmented, clothed with short hairs, and each with a stouter hair at apex.

Holotype, male.—Winslow, Arkansas, Devil's Den State Park, March 30, 1941, M. W. Sanderson. In the collection of the Illinois Natural History Survey.

Allotype, female.—Same data as for holotype.

Paratypes.—Same data as for holotype, 3 ♂, 3 ♀; June 8, 1946, 5 ♂, 3 ♀.

Literature Cited

- Blackwelder, R. E. 1943. Bull. 182, U. S. N. M., 40.
Hatch, M. H. 1927. Tech. Bull. 48, Univ. of Minn. Agr. Exp. Sta., 9.
Handlirsch, Anton. 1924. In Schroder's Handbuch der Entomologie 3: 567.

A NEW CORIXID FROM GEORGIA (Hemiptera, Corixidae)

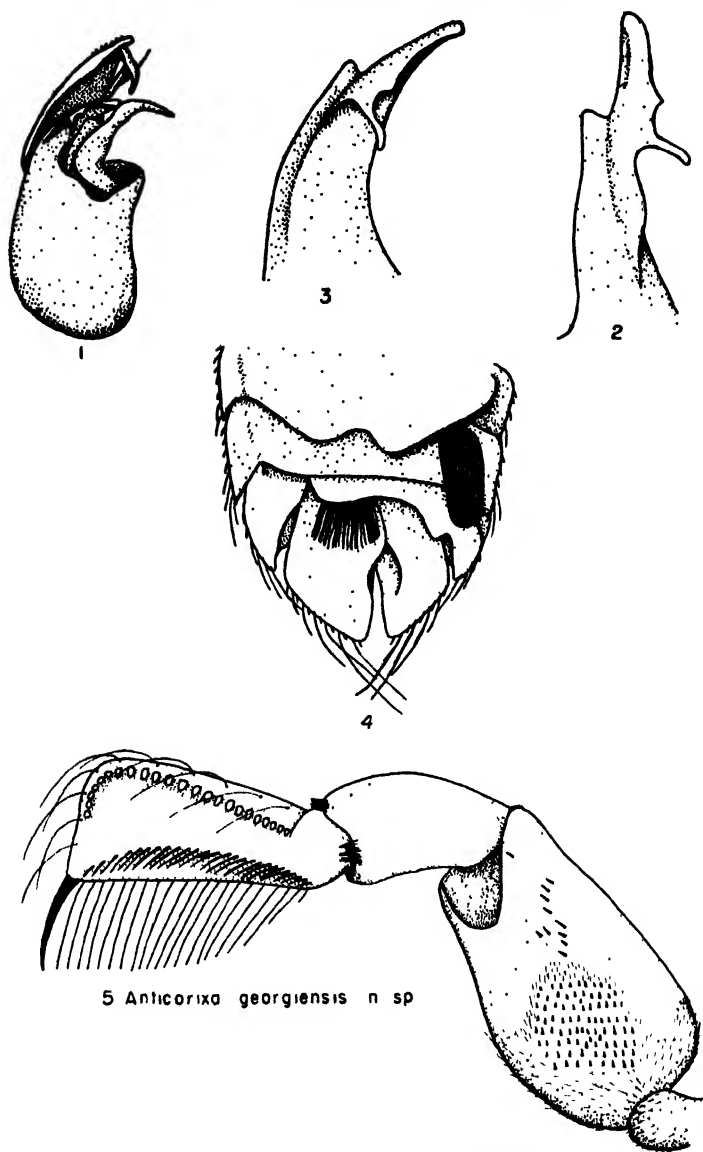
ADDIE M. EGBERT
Lawrence, Kansas

Anticorixa georgiensis n. sp.

Size: Length 8.8 mm. Width of head across eyes 3.2 mm.

Color: General facies rather dark. Pronotum crossed by eight or nine dark, regular bands which are interrupted along the center beyond the pronotal carina by a narrow pale stripe. Pale figures of clavus almost coalescent basally; dark figures tending to merge along margins. Corium with dark figures broad, transverse, irregular; black patch at distal end of embolium and at inner distal angle of corium; outer distal angle with a V-shaped patch of pale yellow. Membrane separated from corium by a pale brownish line; membranal pattern paler, except along outer border which has blackish patch. Head, legs, and venter pale.

Structural Characteristics: Head of male, when viewed from above, a little more than half the length of the pronotal disk; vertex very slightly produced. Facial impression of male shallow, not reaching middle of eyes; facial hairs sparse. Antennal segmental proportions 30: 21: 60: 35. Pronotum with a faint median carina on anterior fifth; disk somewhat pointed at apex. Dorsal aspect of insect shiny, almost without rastration, the pronotum and hemelytra slightly rugulose. Hemelytra with very few hairs. Pruinose area of embolium posterior to nodal suture not quite one-third the length of the embolium. Lateral lobe of the prothorax plainly longer than broad, tip truncate. Mesoepimeron narrow with the scent gland osteole near the tip. Metaxyphus arrow-shaped, longer than broad. Male pala falcate with distal margin almost straight; about 23 teeth in peg row, of which those



Explanation of Plate

- Fig. 1 Genital capsule from right side.
 Fig. 2 Right view of tip of 9th segment, enlarged.
 Fig. 3 Ventral view of 9th segment, enlarged.
 Fig. 4 Dorsal view of ♂ abdomen.
 Fig. 5 Right foreleg of ♂.

at either end are smaller than those in the middle; basal carina plainly visible. Tibia of foreleg about two-thirds as long as the pala, with dorsal carina bearing a cluster of three or four spines at distal end. Fore femur relatively stout, with about 8 or 9 rows of stridulatory pegs on inner surface near base. Middle and hind legs relatively slender; hind leg with tibia slightly longer than the femur; the proportions of segment to segment as follows:

Middle leg—femur: tibia: tarsus: claw:: 100: 46.4: 37.1: 35.9.

Hind leg—femur: tibia: tarsus: tarsus₂:: 100: 102: 122.4: 32.6.

Male asymmetry dextral; strigil very long, reaching from posterior margin of segment 5 almost to the posterior margin of segment 7, and having 10 rows of regular striae. For details of male structures, see plate.

Comparative Notes: This species is nearest in general appearance to *Anticorixa laevigata* (Uhl.) and to *A. lucida* (Abbt.). It differs from the former in having a non-reticulate hemelytral pattern and a clearly defined membranal suture, and from the latter in being almost without rastration, in having a complete corial pattern, and in having the tibia of the hind leg slightly longer than the femur.

Type Locality: Georgia.

Described from one male taken in Baker Co., Georgia, Oct. 23, 1927, by C. H. Martin. Holotype in the Snow Entomological Collections.

NOMENCLATURE NOTES ON THE FAMILY DORILAIIDAE (Pipunculidae-Diptera)

D. ELMO HARDY*
Ames, Iowa

As was pointed out in the writer's Revision of the Nearctic Dorilaidae¹ there are genera in this family that were founded upon misidentified genotypes. In dealing with these genera, Opinion 65 of the rules of Zoological Nomenclature has been followed and in accordance with this opinion the named genotype has been accepted regardless of any disparity between it and the original description. A recent paper by Collin² states that this opinion has been clarified by an article on this matter by the Secretary to the Zoological Commission³ and that the type of a genus is a species, not a name. On these premises Collin has accepted as the genotypes the species actually described rather than the species named. The writer has read Hemming's discussion, which Collin used as his authority, but has failed to arrive at the same conclusions as Collin. Hemming's report states "the Committee is of the opinion that as a specimen is the type of a species, so a species is the type of a genus, and hence that when an author names

* Assistant State Entomologist.

a particular species as the type of a new genus it is to be assumed that it has been correctly determined." He further states that the reviser of a genus must start with the preliminary assumption "that, where the original author of a genus himself designated the type of that genus, he knew his species and therefore that he correctly identified the species included by him in the genus. . . . The reviser of a genus should therefore accept as the type of that genus the species to which properly belongs the specific name used by the author of that genus when on its first publication he designated its type. . . . The reviser of a genus will occasionally be confronted with evidence showing (or strongly suggesting) that the author of a genus made a mistake in identification when dealing with the species designated by him as the type of the genus." Hemming concludes his article by advising that where a problem concerning misidentified genotypes occurs the reviser should submit the case, with full details, to the International Commission for an opinion. In view of this discussion by the secretary, it seems clear that until a specific opinion is made by the commission the type of a genus remains the species which is named and not necessarily the one that is described. The omnipresence of human errors makes it impossible to arrive at any point of taxonomic stability when such problems are left up to individual interpretations for their solution. When dealing with original descriptions it is not always possible to decide exactly what the author had before him and individual interpretations will often differ greatly. It is therefore, imperative that such matters be settled by the Committee on Zoological Nomenclature and not by individual taxonomists.

A brief review of the genera and names in the *Dorilaidae* which are affected by Opinion 65 is as follows:

Prothechus Rondani

This genus was evidently based upon a misidentified genotype. *Pipunculus auctus* Fallen was the species which Rondani indicated as his genotype, yet from his description it seems evident that he had a specimen of *Dorilinae* with an appendiculate fourth vein. The species evidently belonged to the group now known as *Cephalosphaera*. There are two species in Europe which belong to this genus and there is no way of knowing which one Rondani actually had before him. If the commission should decide that this genus be defined by the described species rather than the named genotype, the generic name will be changed to *Verrallia* Mik, and the name *Prothechus* will have to replace *Cephalosphaera* in a different genus.

Cephalosphaera Enderlein

This is apparently the genus which Rondani described as *Prothechus* but as *Prothechus* is isogenotypic with *Verrallia* Mik, according to designated genotypes, the name is not available for use here under the provisions of Opinion 65. As stated above the name *Prothechus* will have to replace *Cephalosphaera* if the commission decides in favor of the described species.

Tömösváryella Aczel

This name will have to be replaced by **Alloneura Rondani** if Opinion 65 is not followed. Rondani used **Pipunculus flavipes** Mg. as his genotype but his description indicates that his specimen belonged to quite a different species in the group of Dorilaidae having no stigma in the wing. This group has since been divided into four genera but Collin has indicated that Rondani's species was congeneric with **Tömösváryella** Aczel.

The full particulars of these cases have been submitted to the Secretary of the International Commission on Zoological Nomenclature and a request has been made for an official decision to be made on these matters. Until this opinion is published it will be best that we follow Opinion 65 and not cause more confusion by following the decisions of individual taxonomists in cases involving misidentified genotypes.

Literature Cited

- 1 1943, Univ. of Kans Sci Bull, 29, 1-231.
- 2 1945, Ento Month Mag, 81, 1-6
3. 1943, The Generic Names of British Insects, Part 8, 326-342.

**A NEW SPECIES OF STENOCRANUS AND NOTES ON A
BAKERELLA (Homoptera-Fulgoridae-Delphacinae)**

R. H. BEAMER

Lawrence, Kansas

***Stenocranus sandersoni* n. sp.**

This species comes out in Beamer's key to **Stenocranus** of North America (Jour. Kans. Ent. Soc., Vol. 19, No. 1, Jan. 1946, p. 2) in couplet 3 with **S. felti** V D. and **S. arundineus** Metcalf. It may be separated from the latter by its much smaller size and by having but one pair of very short anal hooks, and from the former by its almost total lack of dark color on elytra, anal hooks not bifid and aedeagal process more or less sword-shaped. Length ♂ 4.75, ♀ 5.2 mm.

Front not quite three times as long as greatest width, sides almost parallel on apical two thirds, slightly narrowed on basal third, moderately tricarinate, about uniformly buff-colored throughout; vertex slightly longer than basal width, with lateral fovea concolorous with vertex; elytra of medium length, sides almost parallel, apices rounded; M_1 and M_2 not stemming from R, not or very slightly curved to costa.

General color buff with a rather narrow median white line; elytra semi-hyaline with veins very slightly darker, occasionally a specimen with a distinctly darker wedge from cross veins to tip on mesal margin; legs buff to slightly lineate.

Genitalia: In lateral view anal segment large with pair of short, sharp, ventrally-projecting processes of about equal length; aedeagus long and

slender, widest at base, gently narrowed to curved apex; aedeagal process slightly more than two-thirds as long as aedeagus, more than twice as wide at base as shaft of aedeagus at same place, gently narrowed on outer two-thirds to sharp point; styles widest at base, sinuate and narrowed to sharp apices; in ventral view broadest at base, sharply narrowed near middle to avicephaliform apex.

Holotype ♂, allotype ♀, 87 ♀ and 84 ♂ paratypes, Orland Park, Ill., July 13, 1946, R. H. Beamer. Types in the Snow Entomological Collections. Paratypes in Illinois Natural History Survey, Urbana, Ill.

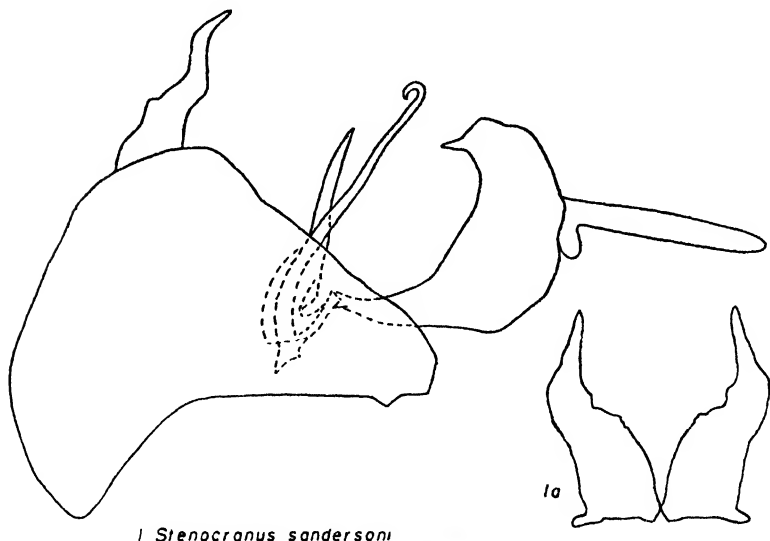
Doctor Milton W. Sanderson of the Illinois Natural History Survey took me to this locality and I take pleasure in dedicating this species to him.

***Bakerella muscotana* Bmr.**

Bakerella muscotana Beamer, R. H. Jour. Kans. Ent. Soc., Vol. 19, No. 3, p. 82, July, 1946.

Additional specimens of this species were taken at Orland Park, Illinois, July 13, 1946, including many macropterous specimens of both sexes. The males are like the females except slightly smaller.

The allomorphytype ♂ and 16 parallomorphytypes are here designated.



1 *Stenocranus sandersoni*

1a

Explanation of Plate

1. Lateral view of ♂ genital segment of *Stenocranus sandersoni*.
- 1a. Ventral view of ♂ styles of *Stenocranus sandersoni*.

SOME INSECT FOOD OF THE SAGE SPARROW

G. F. KNOWLTON and WM. P. NYE

Utah State Agricultural College, Logan, Utah

Forty-five specimens of the sage sparrow, *Amphispiza nevadensis*, were collected in sage, rabbitbrush and greasewood areas of Utah from 1934 through 1942. Examination of the preserved stomachs reveal the following insect material, still in recognizable condition:

Six Thysanura; 4 Collembola; 20 Orthoptera, 19 being adult and 2 nymphal shorthorned grasshoppers and 1 meadow grasshopper; 2 Thysanoptera.

The 231 Hemiptera present included 4 Scutelleridae, 1 Cydnidae, 6 Pentatomidae of which 2 were *Carpocoris remous* Horv., 1 Corizidae, a *Corizus hyalinus* (Fabr.), 1 Coreidae, 154 Lygaeidae included 125 adult and 17 nymphal *Nysius ericae* (Sch.), 3 *N. californicus* Stal, 2 *Geocoris pallens* var. *decoratus* Uhler, 1 Nabidae *Nabis alternatus* Parsh., 8 Miridae, 4 being *Lygus*, 1 a *L. elisus* Van D.; 212 Homoptera included 34 adult and 72 nymphal *Eutettix tenellus* (Baker) beside 7 other adult and 3 nymphal leafhoppers, 8 Membracidae, among them 3 *Pubilla modesta* Uhler and 1 *Leioscyta ferruginipennis* (Godg.), 3 Fulgoridae, 39 Aphididae, among them 1 *Cinara* sp., 5 *Macrosiphum pisi* (Kalt.), 5 *M. coweni* Hunter and 1 *Aphis bonnevillensis* Knlt., and 39 Coccidae, largely scale insects.

The 37 Coleoptera contained in recognizable form included 2 Dermestidae larvae, 1 Buprestidae, 1 Elateridae, 1 Cerambycidae, 2 Chrysomelidae, one being a flea beetle, and 2 weevils; 8 larval Lepidoptera and 3 eggs. Nineteen Diptera were recognized all but one being adult, including 2 female mosquitoes and 2 Tipulidae; 116 Hymenoptera were present of which 90 were ants and 1 chalcid.

In addition to the insects listed above, recognized at least to order there were numerous grasshopper and some coleopterous mandibles present as well as a large number of other insect fragments. In addition, 6 spiders and 852 seeds, mostly weed seeds, were found. Large numbers of seed and plant fragments were present in a number of the stomachs.

SOME NEW SPECIES OF DELPHACODES (Homoptera, Fulgoridae, Delphacinae)

R. H. BEAMER

Lawrence, Kansas

Delphacodes nigripennata n. sp.

Brachypterous form:

Resembles *D. alexanderi* (Metcalf) but front without black longitudinal stripes, anal segment with two pairs of processes and aedeagus bent dorsally almost at right angles near base. Length ♂ 2.0 mm.

Structure: Front about three times as long as wide, widest slightly below middle, slightly narrowed on apical third to apex, narrowed about one-fourth on basal third, definitely tricarinate; crown longer than width be-

tween eyes, carinae barely visible; elytra widest near middle, reaching to genital capsule, apices broadly rounded.

Color: Head, pronotum and most of body except abdomen tawny, abdomen mostly dark brown to black, with two dorsal light crossbands, some light spots on lateral margins of dorsum and narrow light hind margins of ventral segments; large dark spot above hind coxae; elytra black or very dark brown, shining, veins raised.

Genitalia: In lateral view anal segment with two pairs of processes; aedeagus bent dorsally near base with dorsal margin bulged near middle, some small teeth in region of this bulge; styles aviccephaliform, beak sharp, head high and fairly sharp.

Holotype ♂ and 1 ♂ paratype, Hutchinson, Kans., Aug. 5, 1945, R. H. Beamer; other paratypes: 3 ♂♂, Medora, Kans., same day and collector; 1 ♂, Clark Co., Kans., Sept. 14, 1944, R. H. Beamer; 1 ♂, Meade Co., Kans., Sept. 13, 1944, R. H. Beamer; 1 ♂, Medora, Kans., July 6, 1945, R. H. Beamer.

Macropterous form:

Like the short-winged form except wings about one-third longer than abdomen, semihyaline with veins darker, widest in region of crossveins. Color dark brown, with legs somewhat lighter.

Holomorphotype ♂, Old Town, Fla., July 11, 1939, R. H. Beamer.

Types in Snow Entomological Collections.

***Delphacodes silvae*, n. sp.**

Brachypterous form:

Resembling *D. nigripennata* but anal segment of male with but one pair of processes, sides of aedeagus nearly parallel with spines throughout and styles aviccephaliform in ventral view. Length ♂ 2.2 mm.; ♀ 2.6 mm.

Structure: Front with sides almost parallel on basal two thirds, slightly converging at apex and more so on basal third, definitely tricarinate; crown barely longer than width between eyes, indefinitely carinate; elytra widest near middle, apices broadly rounded, ending slightly beyond middle of abdomen, veins raised.

Color: General color stramineous; in female, ovipositor and sheath brown; in male, elytra shining black, also abdomen except dorsum of last two segments including part of genital capsule; also a dark spot above hind coxae.

Genitalia: In lateral view anal segment with a pair of short, heavy processes; aedeagus about four times as long as wide, almost parallel-sided to rounded apex, gently curved ventrally and covered throughout with numerous sharp spines; aedeagal brace evident, narrow at apex; styles more or less pediform, in ventral view aviccephaliform with sharp beak and long narrow head.

Holotype ♂, allotype ♀ and 2 ♂ paratypes, Brownsville, Texas, Dec. 29, 1945, R. H. Beamer, taken in the Palm Forest.

Types in Snow Entomological Collections.

Delphacodes sagae* n. sp.*Brachypterous form:**

Resembles *D. silvae* but smaller, more nearly black all over and aedeagus bent in half circle in lateral view. Length ♂ 1.8 mm.

Structure: Front slightly more than twice as long as wide, sides almost parallel, slightly converging at either end, plainly tricarinate, crown almost square, carinae visible but blunt; elytra almost rectangular, reaching to genital capsule, apices broadly rounded.

Color: General color almost black; head, pronotum, legs and dorsal spot at base of abdomen somewhat lighter.

Genitalia: In lateral view anal segment with two, long sharp processes; aedeagus about four times as long as broad, curved ventrally in almost half circle, sides nearly parallel, band of teeth on outer third; aedeagal brace long and strongly bifid; styles widest at base, bent dorsally on outer half with two short projections on ventral margin.

Holotype ♂ and 12 ♂ paratypes, Fredonia, N.Y., July 21, 1946, R. H. Beamer.

Types in Snow Entomological Collections.

Delphacodes hyalina* n. sp.*Brachypterous form:**

Resembles *D. foveata* (V.D.) but smaller, vertex definitely longer than wide and genital segment of male definitely infuscated. Length ♂ 2.2 mm.; ♀ 2.5 mm.

Structure: Front almost parallel-margined, slightly narrowed at base, moderately tricarinate; crown slightly more than one-third longer than width between eyes; elytra widest near middle, extending barely beyond abdomen, apices rounded, veins raised, sparsely set with fairly large dark setae; hind wings reduced to mere pads, about half size of an eye.

Color: General color stramineous with carinae of front bordered with black, a large black spot above posterior coxae, the anterior fovea of crown black, legs more or less lineate with fuscous and genital capsule infuscated.

Genitalia: In lateral view anal segment with a pair of rather closely appressed, sharp processes; aedeagus about three times as wide at base as near middle; sharply bent dorsad near base, gradually tapered to apex with about four teeth bordering opening on right side; aedeagal brace very long, extending out even with styles; styles pediform, toe long and slender, heel small.

Holotype ♂, allotype ♀, 63 ♂ and 75 ♀ paratypes, Douglas Co., Kans., Aug. 23, 1945, R. H. Beamer. Other paratypes: 23 ♂ ♂ and 25 ♀ ♀, same place and collector, Aug. 27, 1945.

Types in Snow Entomological Collections.

Delphacodes lutea* n. sp.*Brachypterous form:**

Resembling *D. hyalina* but without dark color except in styles, aedeagal brace and aedeagus. Length ♂ 2.1 mm.; ♀ 2.8 mm.

Structure: Front widest near middle, very slightly narrowed toward apex, constricted about one-fourth on basal third, distinctly tricarinate; crown almost rectangular, plainly but feebly carinate; elytra with sides almost parallel, apices broadly rounded, veins raised with scattered, long light setae.

Color: Golden yellow with tips of tarsi, styles, aedeagus and aedeagal brace darker.

Genitalia: In lateral view anal segment without processes; aedeagus broad and with sides almost parallel on basal two-thirds, sharply constricted on ventral margin on outer third with apex directed ventrally; aedeagal brace long and narrow, extending back between the styles; apices of styles pediform with blunt toe and heel.

Holotype ♂, allotype ♀, 41 ♂ and 40 ♀ paratypes, Douglas Co., Kans., Aug. 22, 1945, R. H. Beamer; other paratypes 20 ♂ ♂ and 17 ♀ ♀, same place and collector, Aug. 27, 1945.

Macropterous form:

Like the short wing form but elytra hyaline, widest in region of cross-veins, extending about one-third their length past abdomen.

Holomorphotype ♀ and 8 ♀ paramorphotypes, Douglas Co., Kans., Aug. 22, 1946, R. H. Beamer; 9 paramorphotypes, same place and collector, Aug. 27, 1945.

Types in Snow Entomological Collections.

Delphacodes lappae* n. sp.*Brachypterous form:**

Resembling *D. hyalina* Beamer but dark color on abdomen more or less in a broad lateral band reaching across ventral part of genital capsule, aedeagus enlarged at tip with many teeth and styles in lateral view aviccephaliform. Length ♂ 2.3 mm.; ♀ 3.0 mm.

Structure: Front widest near apical third, gently narrowed to apex and base, definitely tricarinate; crown slightly longer than width between eyes, carinae definite; elytra widest near apex of scutellum, tapering to rounded apex, ending slightly before tip of abdomen in female and at tip in male; hind wings absent.

Color: General color stramineous; carinae of front bordered with fuscous; lateral and apical foveola of crown black; abdomen with a more or less definite broad lateral longitudinal stripe which crosses ventral portion of genital capsule; in female ovipositor and sheath brown, venter more or less flecked with brown.

Genitalia: In lateral view anal segment with a pair of heavy blunt processes; aedeagus about half as wide at base as total length, narrowed near middle on ventral margin, slightly enlarged with many teeth on tip; styles avicephaliform, beak sharp and short, head high and rather sharp.

Holotype ♂, **allotype** ♀, 12 ♂ and 5 ♀ paratypes, Sarita, Texas, Dec. 25, 1945, R. H. Beamer; 1 ♂ paratype, Mission, Texas, Dec. 26, 1945, R. H. Beamer.

Types in Snow Entomological Collections.

***Delphacodes bifurca* n. sp.**

Brachypterous form:

Resembles *D. shermani* but male has a large shining spot on scutellum, another above middle coxae and aedeagus is bifurcate more than one-third its length. Length ♂ 1.8 mm.; ♀ 2.2 mm.

Structure: Front slightly more than twice as long as width, widest near middle, slightly converging toward apex, more so toward base, plainly tricarinate; crown slightly longer than width between eyes, carinae very indefinite; elytra hyaline, widest near tip of scutellum, reaching to genital capsule in male on to fourth abdominal segment in female, apices broadly rounded, veins slightly thickened, sparsely set with setae.

Color: General color stramineous; ovipositor and sheath of female slightly darker; male with large shining black spot on scutellum and above middle coxae, few dark spots on dorsum of abdomen near base, one on each side of genital capsule; styles, aedeagus and hooks of anal segment also darker.

Genitalia: In lateral view anal segment with two large sharp processes; aedeagus bulbous near base, divided from tip to basal fifth, dorsal portion slightly shorter than ventral, sharp pointed, ventral portion with knobbed apex bent ventrally; styles barely visible, parallel with wall of pygofer apex, narrowed and slightly turned out.

Holotype ♂, **allotype** ♀, 7 ♂ and 4 ♀ paratypes, Douglas Co., Kans., Aug. 23, 1945, R. H. Beamer; other paratypes: same place and collector, 3 ♂♂ and 6 ♀♀, Aug. 27, 1945; 1 pair, Aug. 22, 1945; 7 ♂♂ and 3 ♀♀, July 7, 1945; 14 ♂♂ and 3 ♀♀, July 24, 1945; 8 ♂♂ and 2 ♀♀, July 31, 1945; 24 ♂♂ and 6 ♀♀, July 25, 1945; 2 ♂♂ and 4 ♀♀, July 23, 1945; additional paratypes: 4 ♂♂ and 6 ♀♀, Hutchinson, Kans., Aug. 5, 1946, R. H. Beamer, 14 ♂♂ and 36 ♀♀, Medora, Kans., Aug. 5, 1945, R. H. Beamer.

Types in Snow Entomological Collections.

***Delphacodes bocana* n. sp.**

Brachypterous form:

Resembling *D. floridae* Muir and Giff. but crown about as wide as long, black stripes either side median carina of front and elytra about same color as remainder of body. Length ♂ 1.8 mm.; ♀ 2.0 mm.

Structure: Front widest about basal third, slightly narrowing to apex,

more definitely narrowed on basal third, strongly tricarinated; crown almost rectangular, strongly carinated; elytra semihyaline, almost rectangular, reaching to genital segment in male, to middle of abdomen in female, broadly rounded at apices, veins heavier.

Color: General color tawny with following darker areas: genital segment and more or less of sternum of male, ovipositor sheath and area on each side of frontal carina of female.

Genitalia: In lateral view anal segment with a pair of heavy, fairly blunt processes; aedeagus about four times as long as wide, slightly curved dorsally throughout with a number of small teeth near middle on dorsal margin and a few on side near apex; styles rather short, almost parallel-sided.

Holotype ♂, allotype ♀, 1 ♂ and 8 ♀ paratypes, Brownsville, Texas, Dec. 27, 1945, R. H. Beamer.

Macropterous form:

Like short wing form except elytra extending about one-third their length beyond abdomen, widest beyond crossveins, veins raised, darker beyond crossveins.

Holomorphotype ♂, same data as brachypterous form.

Types in Snow Entomological Collections.

INDEX—VOLUME 19

Ball, E. D., Article by . . .	73	Knowlton, G. F., Articles by . . .	23, 71, 139
Beamer, Lucy, Article by . . .	127	Lindquist, Arthur W., Article by . . .	13
Beamer, R. H., Articles by . . .	1, 15, 82, 139	Madden, A. H., Article by . . .	13
Butterflies, Notes on Kansas . . .	110	Minthosella in the United States (Diptera, Tachinidae), The Genus . . .	52
Calkins, LaVere A., Article by . . .	66	Mistharnophantia Kirkaldy (Subfamily Flatinae, Fulgoridae, Homoptera), Some New Species of the Genus . . .	111
Cercopidae or Spittlebugs of Missouri, The . . .	30	Notonectidae, A New Genus and Species of . . .	59
Cochliomyia americana in Arizona, Population Studies on . . .	26	Nye, William P., Article by . . .	139
Corixid from Georgia (Hemiptera, Corixidae), A New . . .	133	Paracilus (Diptera: Dolichopodidae), Two New . . .	23
DDT, Effect of Temperature on Knock-Down and Kill of Mosquitoes and Bedbugs Exposed to . . .	13	Parker, Frank H., Article by . . .	73
Dean, George A., Article by . . .	37	Parker, Ralph L., Article by . . .	11
Delphacine Fulgorid with Notes on Four Other Species (Homoptera- Fulgoridae-Delphacinae), A New Species of . . .	82	Phyllophaga from Texas (Coleoptera, Scarabaeidae), A New . . .	69
Delphacodes, Some New Species of . . .	139	Pseudococcus juniperi Ehrhorn, Notes on the Juniper Mealy Bug . . .	66
Deonier, Christian C., Article by . . .	26	Reinhard, H. F., Articles by . . .	52, 69
Doering, Kathleen C., Article by . . .	111	Sanderson, Milton W., Article by . . .	130
Dorilaidae (Pipunculidae-Diptera), Nomenclature Notes on the Family . . .	135	Scaphytopilus (Homoptera-Cicadellidae), A New Subgenus and Several New Species of . . .	87
Egbert, Addie M., Article by . . .	133	Schroeder, H. O., Article by . . .	13
Epitedia Jordan (Siphonaptera), A New Species of . . .	62	Shepherd, Chester J., Article by . . .	111
Erythroneura of the Vulnerata Group, The . . .	15	Smith, Roger C., Article by . . .	37
Froeschner, Richard C., Article by . . .	30	Stallings, Don B., Article by . . .	110
Grasshoppers Eaten by Utah Birds . . .	71	Staphylinidae (Coleoptera), A New Genus of Nearctic . . .	130
Hardy, D. Elmo, Article by . . .	135	Stenocranus in America North of Mexico, The Genus . . .	1
Harmston, F. C., Article by . . .	23	Stenocranus and Notes on a Bakerella (Homoptera-Fulgoridae-Delphacinae), A New Species of . . .	137
Hepner, Leon W., Article by . . .	87	Summary, The Fifteenth or 1945 Annual Insect Population of Kansas . . .	37
Hungerford, H. B., Article by . . .	59	Turner, J. R., Article by . . .	110
Idiocerus (Homoptera: Cicadellidae), Some New North American . . .	73	Typophorus viridicyaneus (Crotch), (Coleoptera, Chrysomelidae), Additional Host and Distribution Records of the Sweetpotato Leaf Beetle . . .	11
I'll Tell You How . . .	127		
Insect Food of the Sage Sparrow, Some . . .	139		
Jameson, Jr., E. W., Article by . . .	62		
Kelly, E. G., Article by . . .	37		

PRICE OF BACK VOLUMES

Back Volumes \$2.50 per volume

Subscriptions for back volumes or numbers should be sent to Donald A. Wilbur, Department of Entomology, Kansas State College, Manhattan, Kansas.

CONTENTS OF THIS NUMBER

Some New Species of the Genus <i>Mistharnophantia</i> , Kirkaldy (Subfamily, Flatinae, Family Fulgoridae, Homoptera).	
KATHLEEN C. DOERING and CHESTER J. SHEPHERD	111
I'll Tell You How.	
LUCY BEAMER	127
A New Genus of Nearctic Staphylinidae (Coleoptera).	
MILTON W. SANDERSON	130
A New Corixid From Georgia (Hemiptera, Corixidae).	
ADDIE M. EGBERT	133
Nomenclature Notes on the Family Dorilaidae (Pipunculidae-Diptera).	
D. ELMO HARDY	135
A New Species of <i>Stenocranus</i> and Notes on a <i>Bakerella</i> (Homoptera-Fulgoridae-Delphacinae).	
R. H. BEAMER	137
Some Insect Food of the Sage Sparrow.	
G. F. KNOWLTON and WM. P. NYE	139
Some New Species of Delphacodes (Homoptera, Fulgoridae, Delphacinae).	
R. H. BEAMER	139
Index to Volume 19	145

I. A. R. I. 75

INDIAN AGRICULTURAL RESEARCH
INSTITUTE LIBRARY,
NEW DELHI.

Date of issue.	Date of issue.	Date of issue
26.6.57		
21.1.63		
13/2/63		
11 MAY 1970		
15 MAY 1970		
19 MAY 1973		